



The MEMS Solution Disruption

Leopold Beer, Bosch Sensortec

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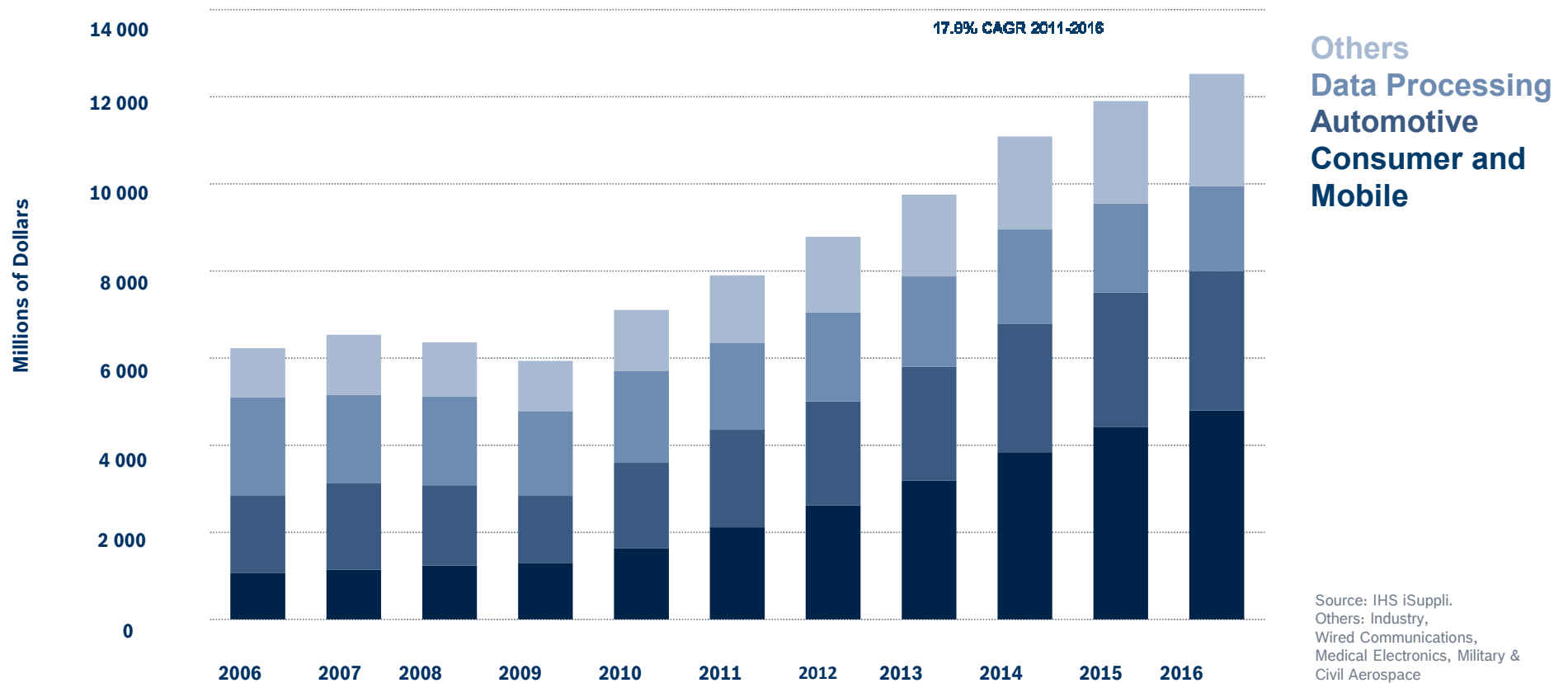
- 02** Technology Drivers – Future Calling

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MEMS Markets

Since 2012 CE MEMS > Automotive MEMS Market



Source: IHS iSuppli.
Others: Industry,
Wired Communications,
Medical Electronics, Military &
Civil Aerospace

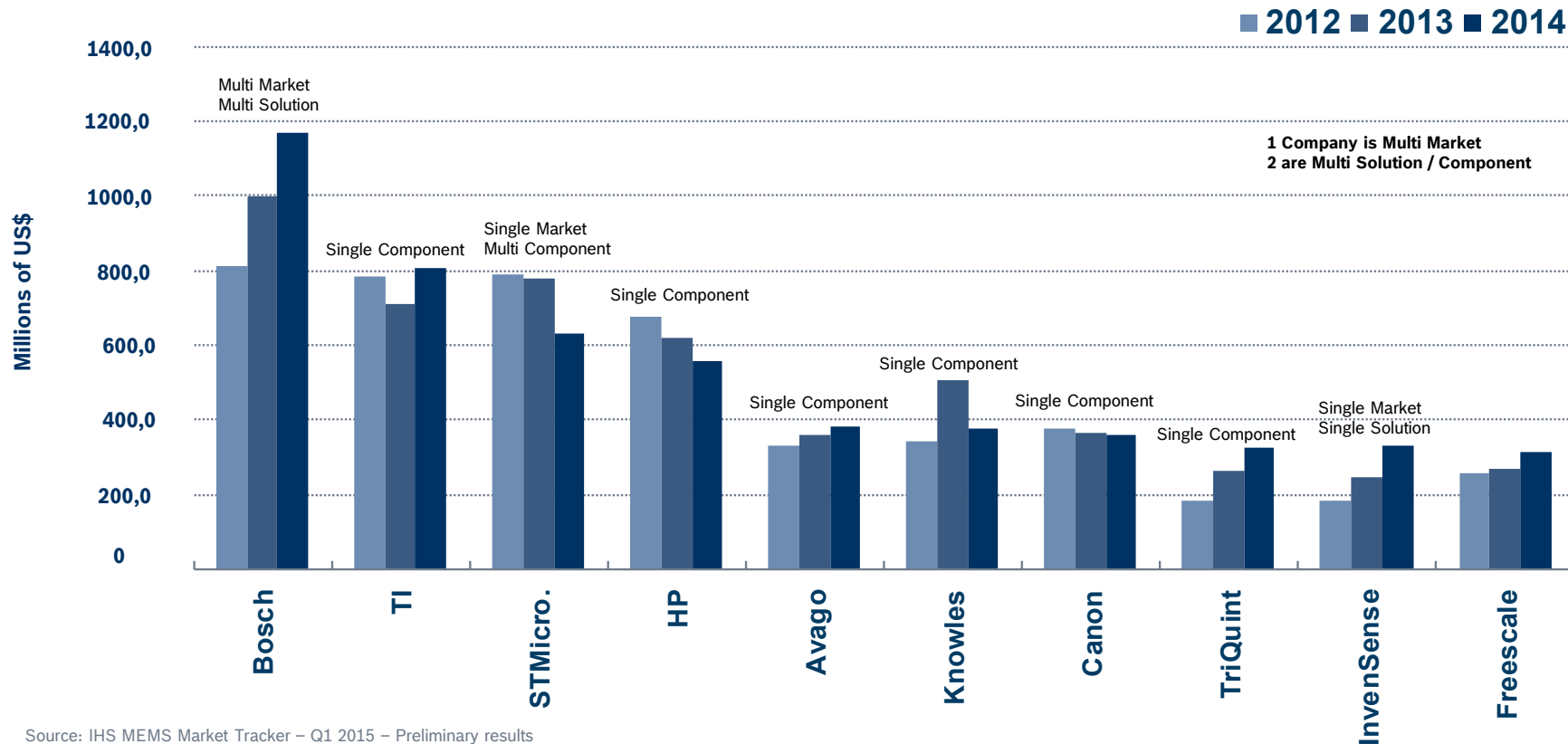
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MEMS Players – Different Success Stories

Sensors & Actuators



Source: IHS MEMS Market Tracker – Q1 2015 – Preliminary results

Notes: Includes magnetometer revenue of Bosch, ST, InvenSense and Freescale. Excludes foundry revenue of ST, TI, Freescale etc. to avoid double counting.

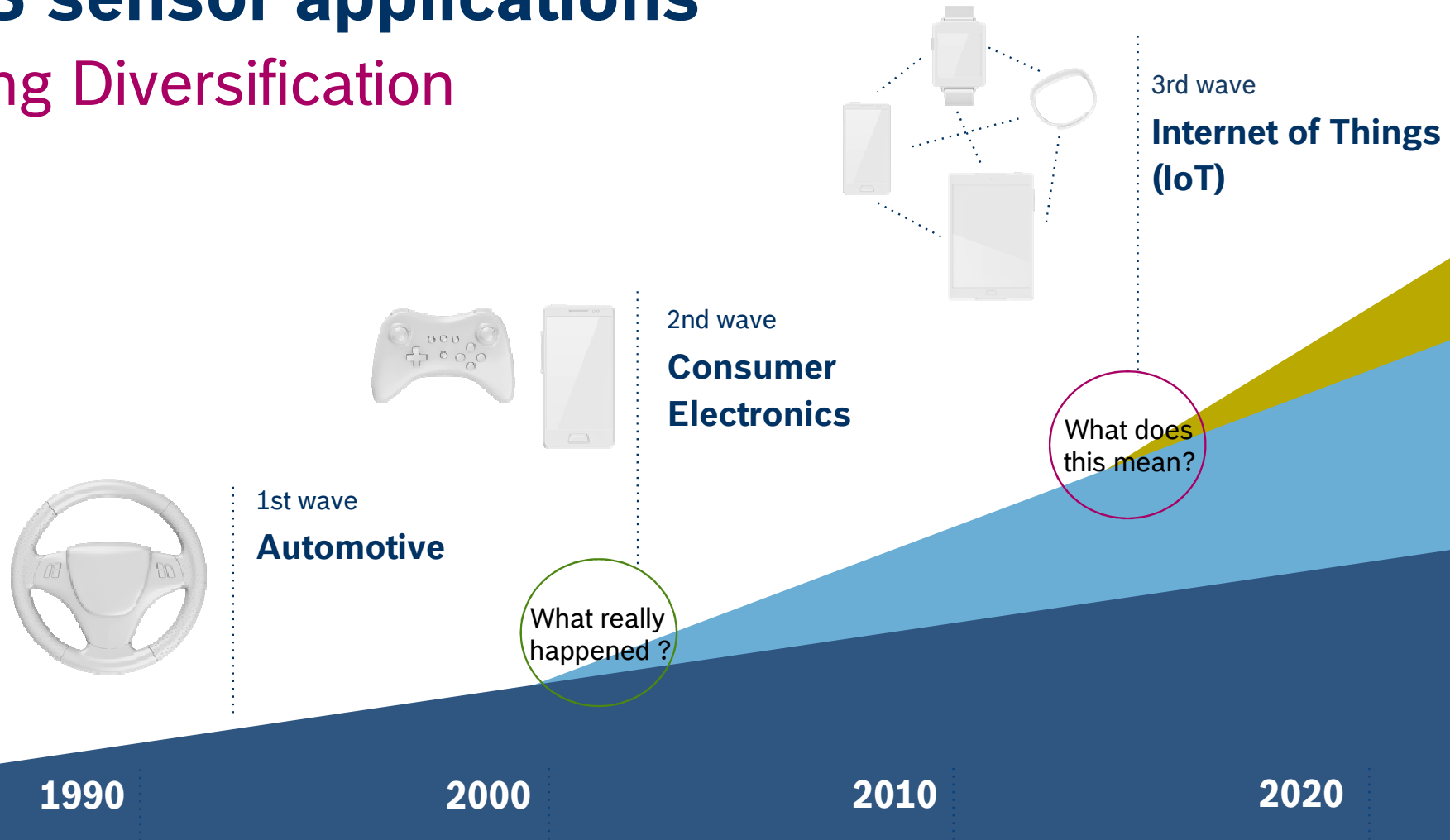
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MEMS sensor applications

Ongoing Diversification

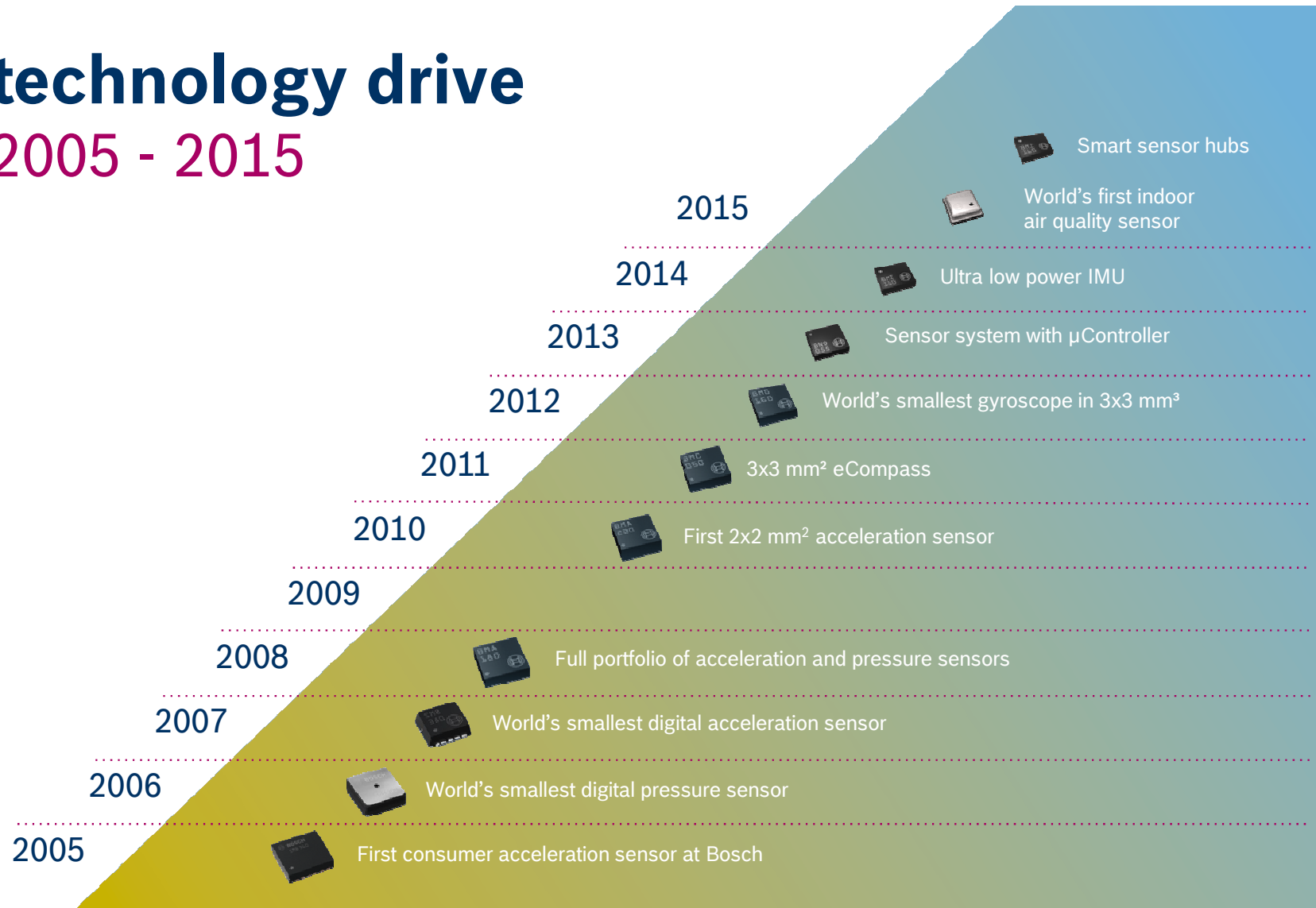
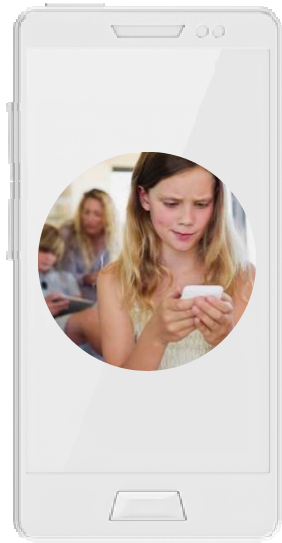


02

Technology Drivers – Future Calling

Yesterday's technology drive

Smartphones: 2005 - 2015



Today's technology drivers

A multitude of CE applications



Well Being



IoT – everything connected



Sports & Fitness



VR & Gaming



Imaging & Video



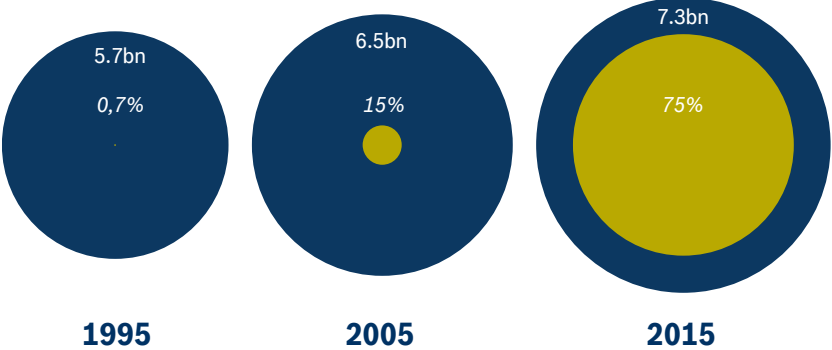
In & Outdoor Navigation

Connectivity & Service = Market Push

Technology evolution

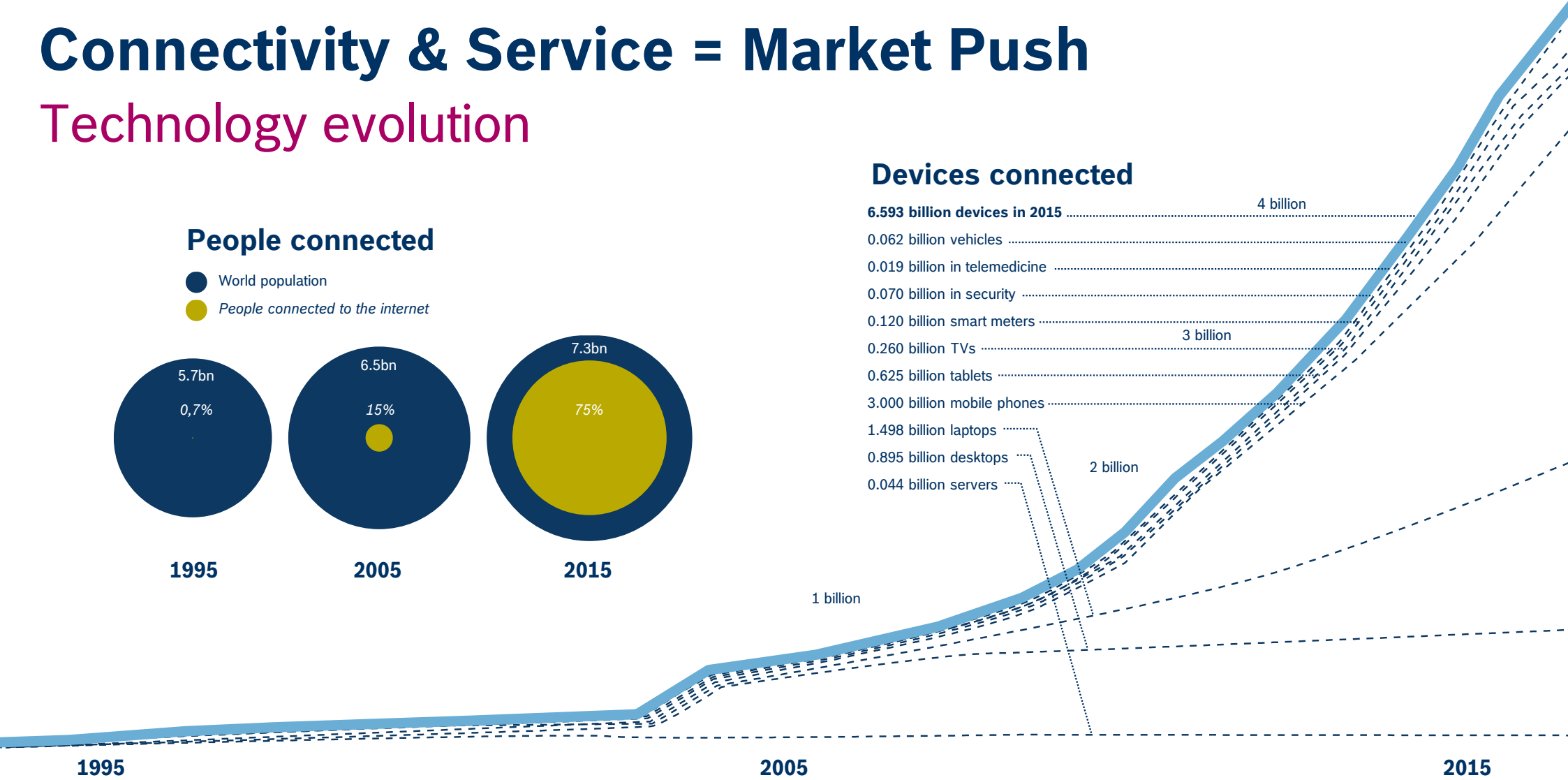
People connected

- World population
- People connected to the internet



Devices connected

- 6.593 billion devices in 2015
- 4 billion
- 0.062 billion vehicles
- 0.019 billion in telemedicine
- 0.070 billion in security
- 0.120 billion smart meters
- 0.260 billion TVs
- 3 billion
- 0.625 billion tablets
- 3.000 billion mobile phones
- 1.498 billion laptops
- 2 billion
- 0.895 billion desktops
- 0.044 billion servers
- 1 billion



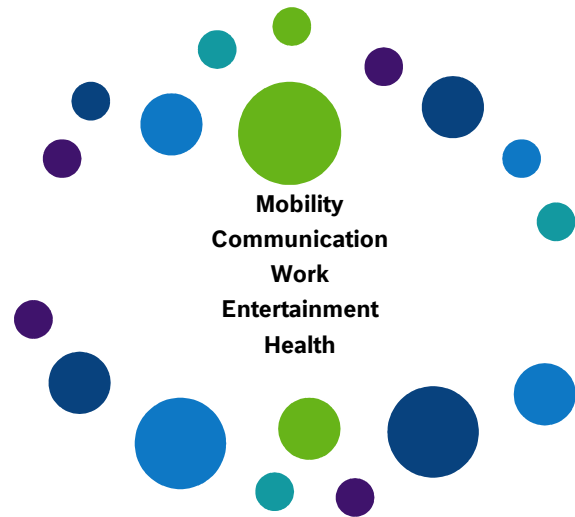
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Direct and immediate implication

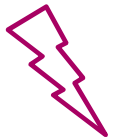
The big application convergence



No domain
borders



No stand alone
applications



New World = Cross Domain Challenge

Application domain
Sensor Node



Body area network



Connected Mobility



Smart Home:
security systems



Smart Home:
heating systems

Low Power
(Integrated power mgnt)

Wireless Interface
(Network Capability)

Integrated Function
(Domain level integration)

Reconfigurable
(Firmware Over The Air)

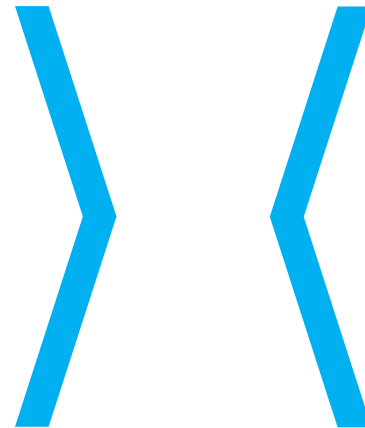
Efficient Modules
(Lots of variants)

Change of requirements

New applications need different solutions

Yesterday's Key success factors

- Smaller **components**
- Lower power **components**
- Lower cost **components**



Today's Key success factors

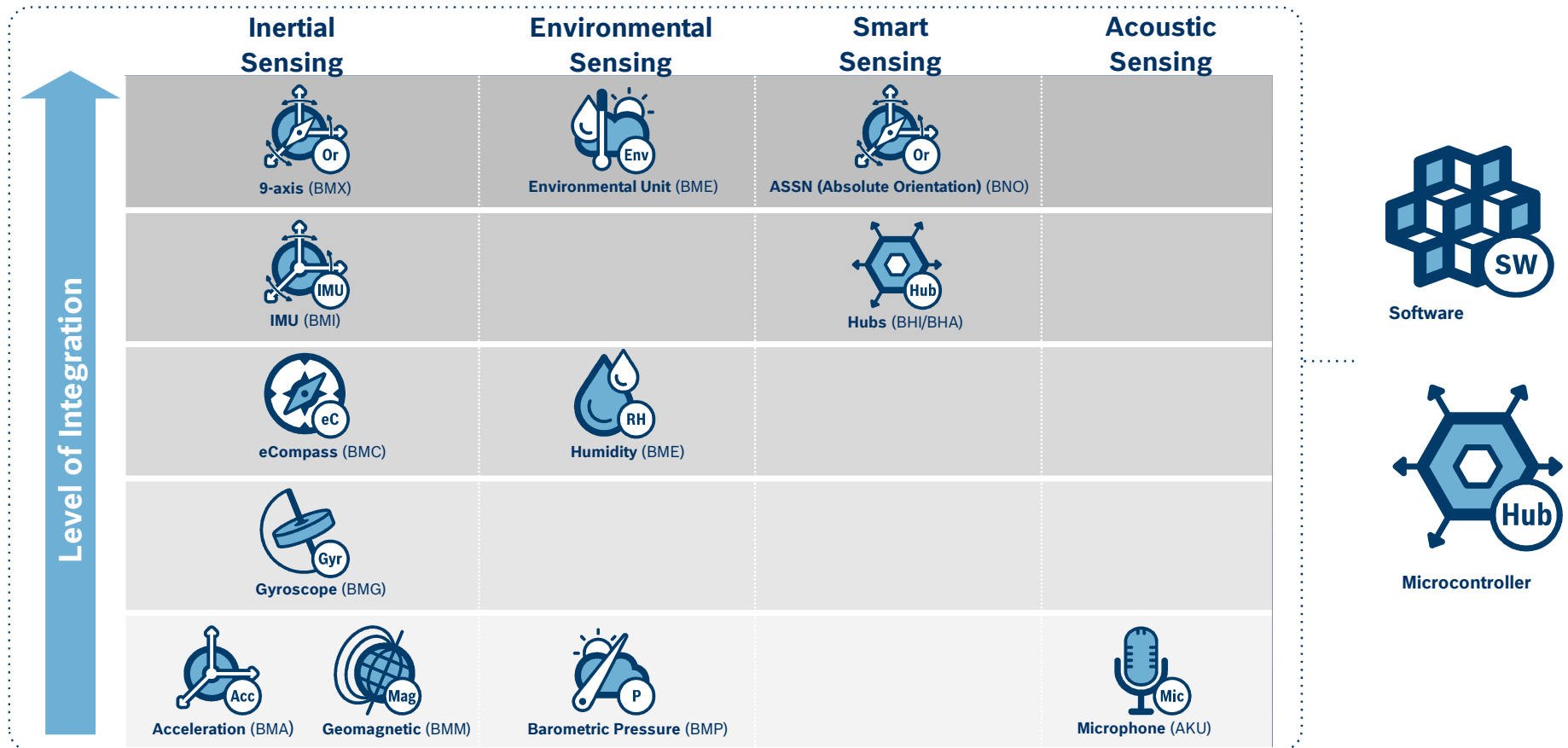
- Integrated **Solutions** (Sensors, μ C, SW)
- Low **System** Power (HW & SW)
- **Domain** know-how (Algorithms)

Component Business

Solution Business

Solution Business

Broad technology portfolio – for integration capability



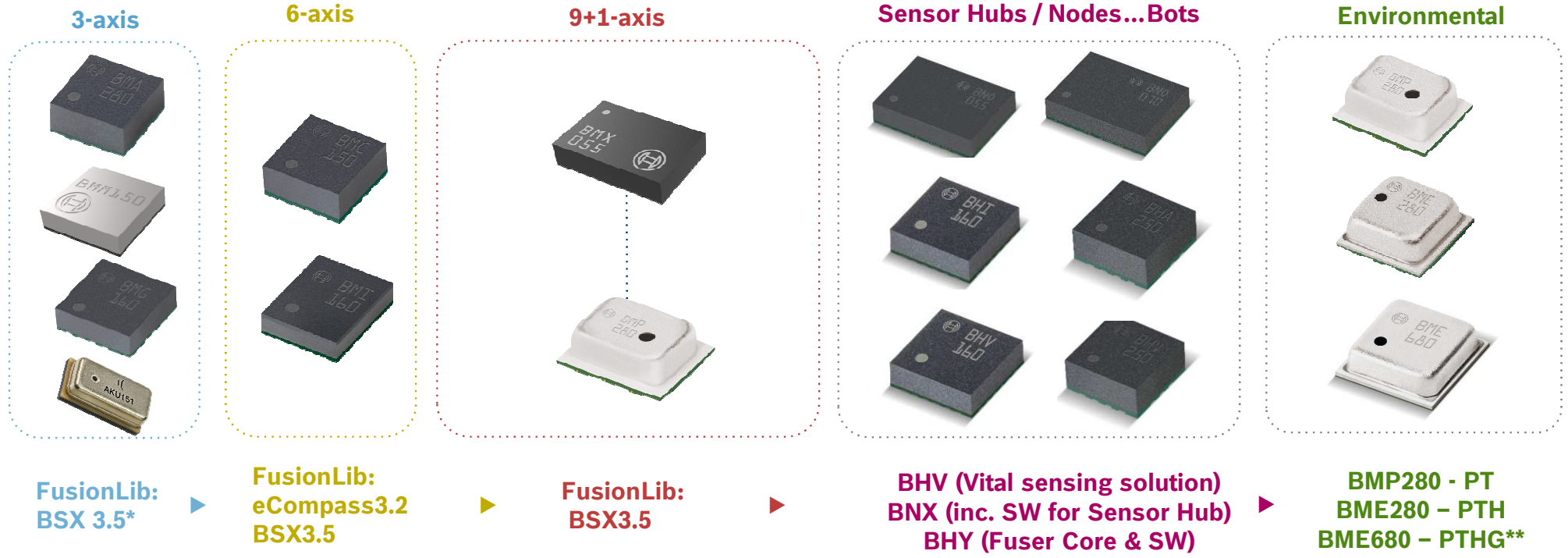
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Solution Business

Various Integration Levels for maximum application coverage



* Bosch Sensortec Sensor Data Fusion
 **Pressure Temperature Humidity Gas

03

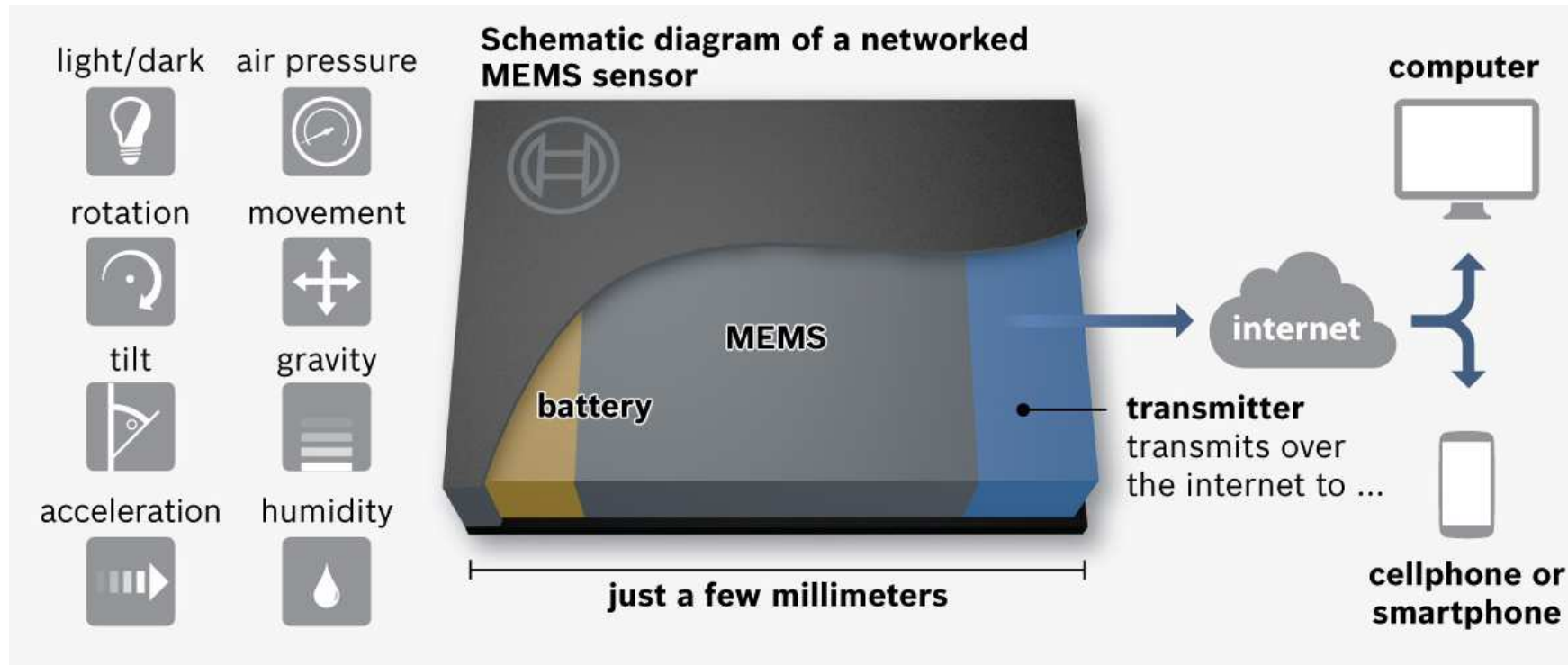
Overcome Solution Fragmentation Dilemma

By solution Integration



The Solution

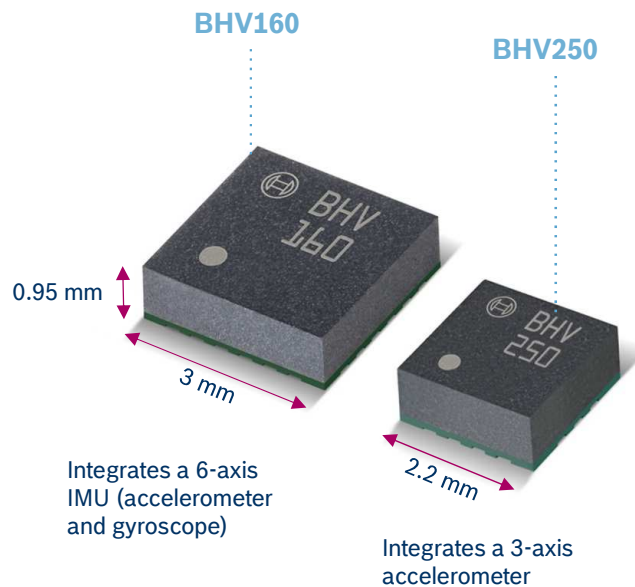
Domain level integration (SIP)



IoT Sensor Node

Ultra Low Power Sensor Nodes

BHV Vital (end to end) Solution



Sensor to Cloud Plug & Play solution

2 component modular approach (BHV & PPG)

Accuracy Optimized Solution

Step counter, activity and PPG algorithms out of one hand – fully optimized

Power Optimized solution

Custom processor core (ultra low power)
Context driven power management

Functional integration at its best

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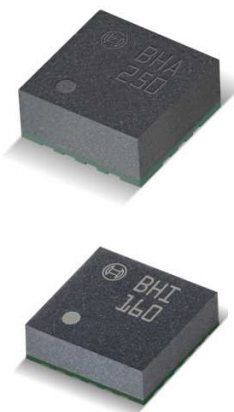


Ultra Low Power Sensor Nodes

BHI & BHA Inertial Product line



User motion
User position
User context



- Quaternion
- Linear Acceleration
- Rotation
- Gravity
- Robust Heading
- eCompass fast Calibration
- Step counter
- Activity monitoring & Interrupt
- Significant motion detection

BHI160 (preliminary)

Package dimensions	3.0 x 3.0 x 0.95 mm ³
Temperature range	-40 ... +85 °C
Supply voltage V_{DD} Supply voltage V_{DDIO}	1.71 ... 3.6V 1.6 ... 3.3 V
Typ. current consumption	
Full 9DoF Fusion @100 Hz ODR ¹	1,59 mA
Hub+IMU @100 Hz ODR	1,15 mA
Hub+Gyro @100 Hz ODR	1 mA
Hub+Acc @100 Hz ODR	310 µA
Sign. motion	30 µA
Step detector	30 µA
Suspend mode	11 µA

Already in second generation

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Conclusions

Smart Phones are **not** the MEMS sensor **innovation driver** anymore

Wearables & IoT take over the innovation drive – but in a new way

Domain level integration is the **Key** for enabling **IoT** markets

Bosch Sensortec drives this integration

THANK YOU

TODAY, THREE OUT OF
FOUR SMART PHONES
WORLDWIDE USE BOSCH
SENSORTEC SOLUTIONS.