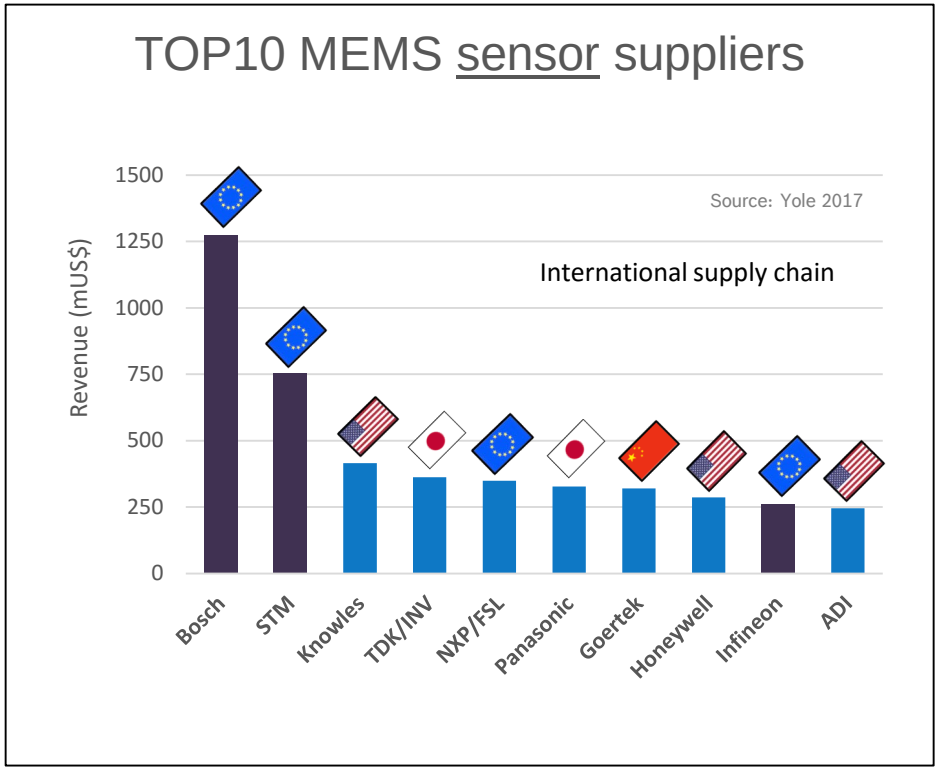
COMPETITIVENESS OF THE EU IN ELECTRONIC COMPONENTS AND SYSTEMS

DR. STEFAN FINKBEINER
CEO, BOSCH SENSORTEC
CHAIRMAN, EPOSS

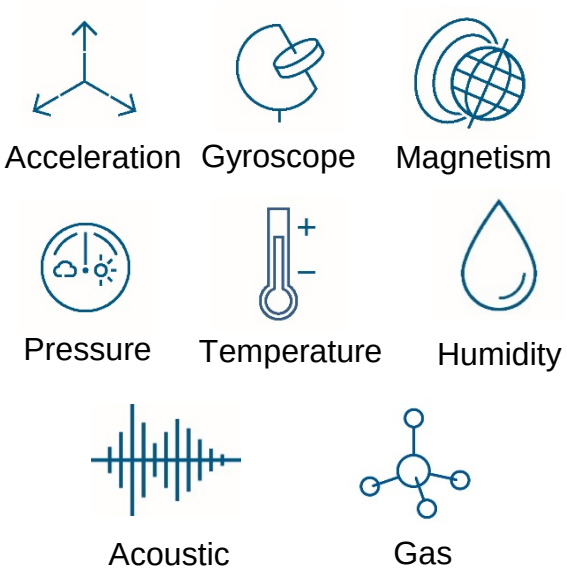
INTRODUCTION – STEFAN FINKBEINER

- Born in 1966 in Freudenstadt, Germany
- PhD in Physics in 1995
- Joined the Robert Bosch GmbH in 1995
- More than 20 years of experience with sensors
- Appointed as CEO of Bosch Sensortec in 2012
- Married, 3 children
- EPoSS chairman since January 2018

SENSORS – WORLD LEADING HIGH TECH FROM EU



Multitude of MEMS sensors



EPOSS – THE EUROPEAN TECHNOLOGY PLATFORM ON SMART SYSTEMS INTEGRATION

- Group of major industrial companies and research organisations from more than 20 EU states.
- Industry-driven policy initiative, defining R&D and innovation needs as well as policy requirements related to Smart Systems Integration and integrated Micro- and Nanosystems.

INDUSTRIAL

Smart systems for robots in collaborative environments (Bosch)

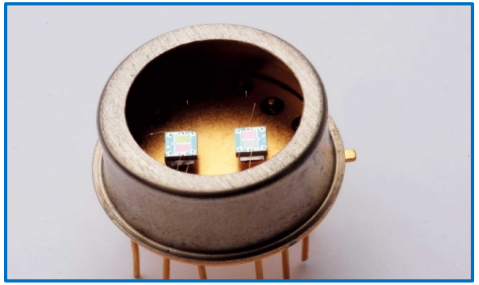
MEDICAL

Intraocular pressure measurement device (Sensimed STM)

AUTOMOTIVE

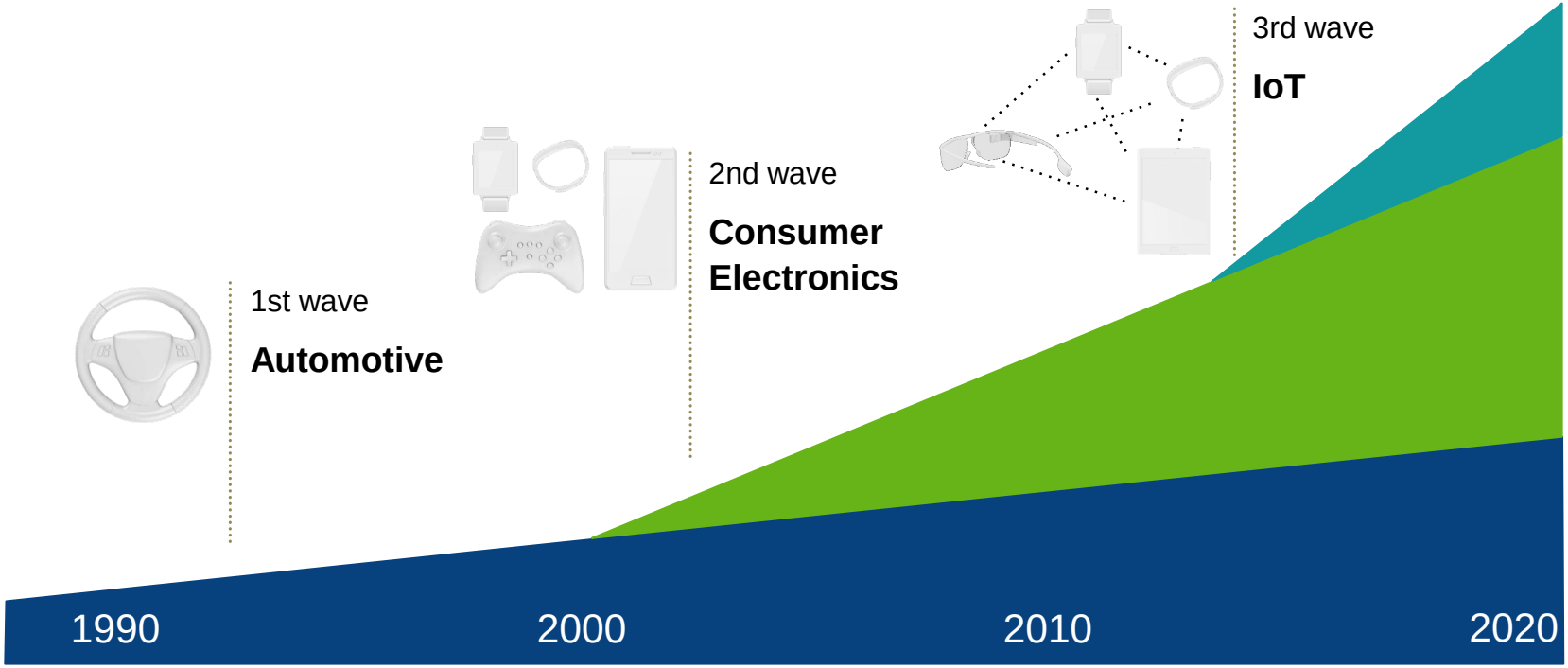
Advanced driver assistance systems (Bosch)

ENVIRONMENTAL

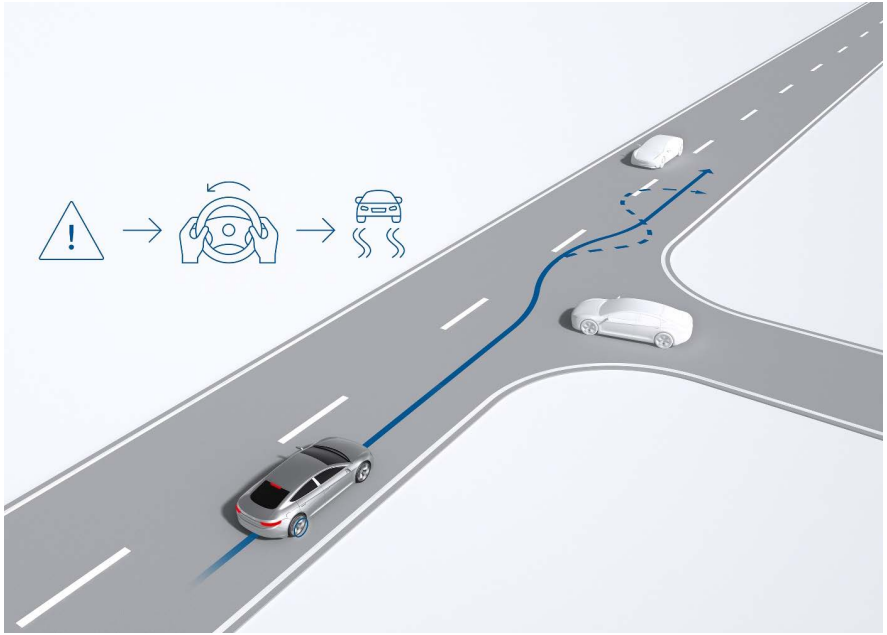


Semiconductor gas sensor (FhG IPM)

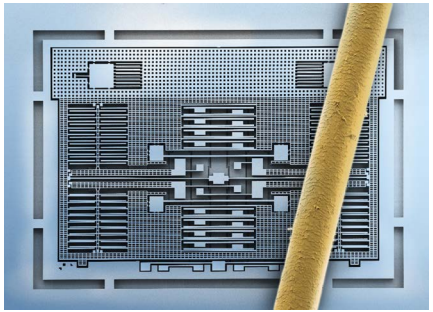
MEMS SENSOR PROLIFERATION



FIRST WAVE: AUTOMOTIVE
ESP® - ELECTRONIC STABILITY PROGRAM



- The anti-skidding system ESP® saves thousands of lives each year – enabled by MEMS sensors.
- Industrialization of MEMS technology was driven by automotive applications.

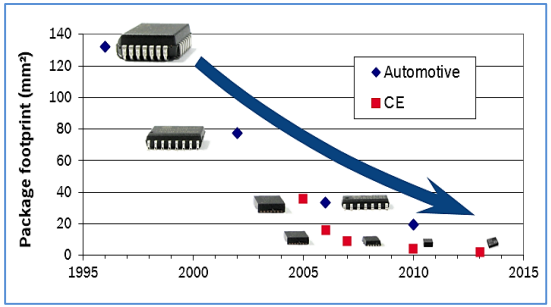


SECOND WAVE: CONSUMER ELECTRONICS
MEMS TECHNOLOGY INNOVATION

EPoSS
European Technology Platform on Smart Systems Integration

Size / power

Continuing shrinking of sensor size and power consumption
(e.g. accelerometer)

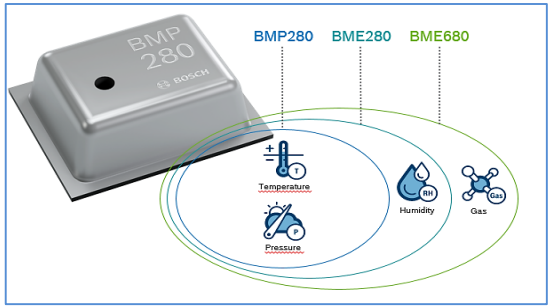


Integration / µC + software

Multi-axis sensors + µC + SW in single combo packages
(e.g. motion / orientation)

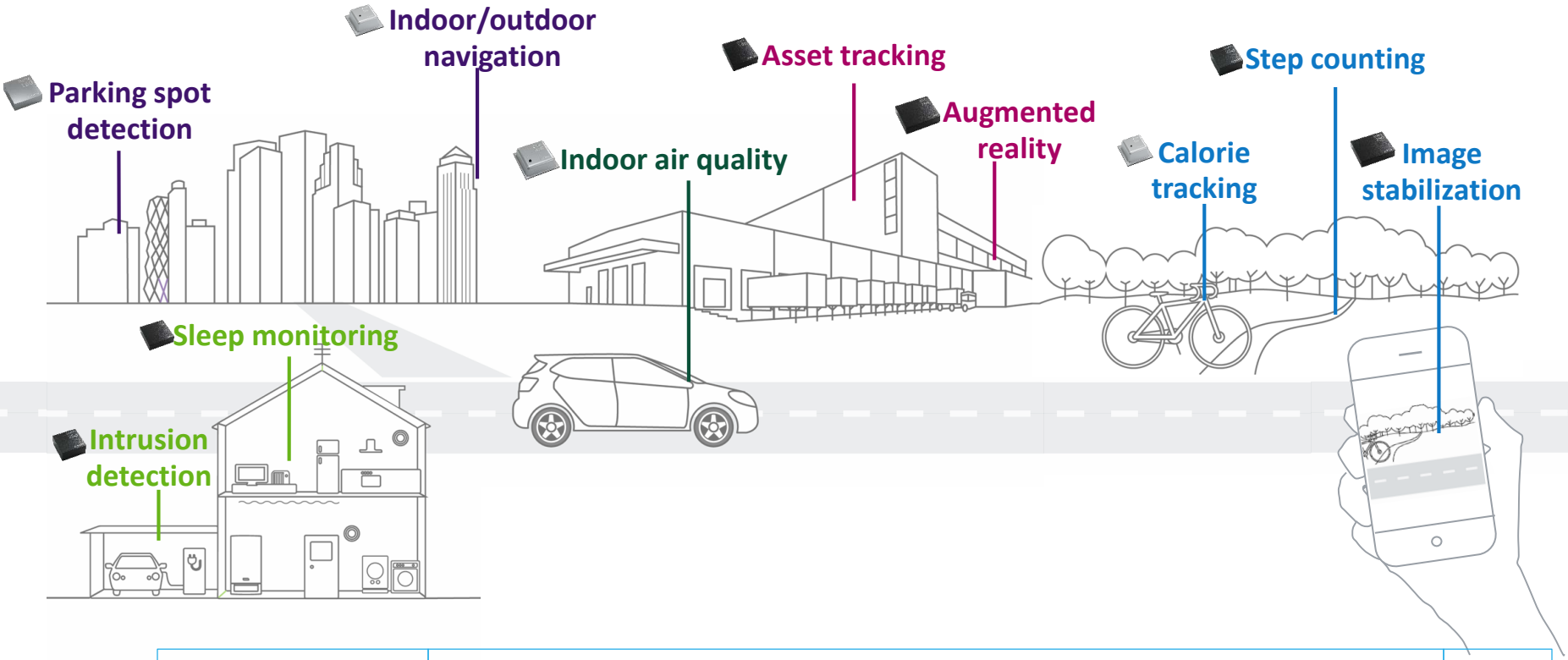
New measurants

Rise / emergence of novel sensor clusters (T, p, H, ...)
(e.g. environmental cluster)

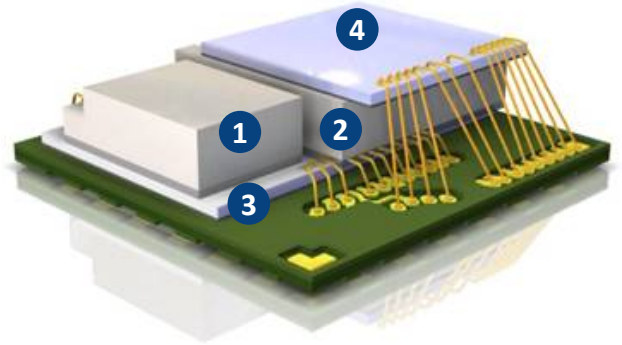


MEMS technology is ready for IoT

THIRD WAVE: INTERNET OF THINGS



WHAT ARE SMART SENSORS?



1 MEMS accelerometer

2 MEMS gyroscope

3 ASIC

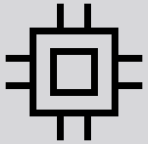
4 Microcontroller

- **HW and SW in one package**:
  - 6-axis IMU
  - + microcontroller
  - + embedded software
- Ideally suited for always-on applications such as **activity-** and **gesture recognition** and **step counting**
- Enables embedded **machine learning** algorithms

MEMS IN A SENSOR NETWORK: FUNCTIONALITY AND CHALLENGES

EPoSS
European Technology Platform on Smart Systems Integration

Sensor (in fixed or mobile device)



IoT node

Router / edge device

Cloud / backend

Sensing and pre-processing

- Small size
- Ultra-low power
- Autonomous functionality through smart algorithms / local intelligence / AI

Data collection and distribution

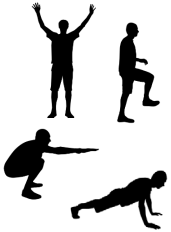
- Connectivity
- Security and privacy provisioning
- Low latency data transmission

Big Data

- Data collection and storage
- Complex data processing (sensors and other devices)
- Added value through swarm intelligence

SELF-LEARNING ALGORITHMS ON SMART SENSORS

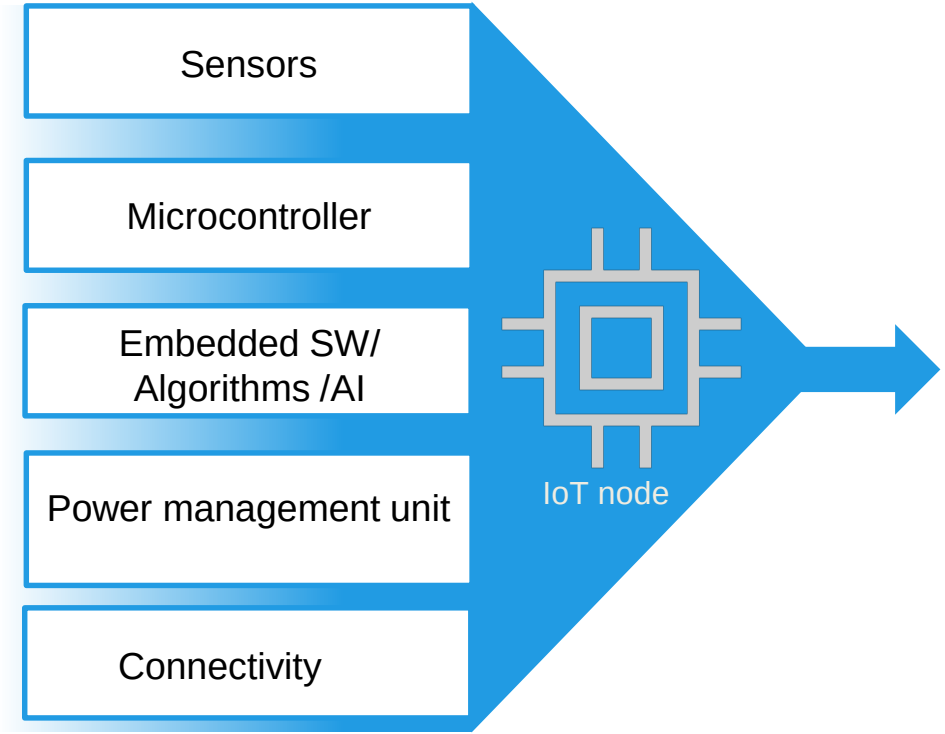
Sensor data → Learn movement in real-time → Exact ID → ID of the movement



Sensor data → Detect matching ID

- Output recognized activity
- Compute meta data (e.g. repeated cycles)

SMART SENSOR NODES – A COMPLEX DESIGN CHALLENGE



- Sensors, microcontroller and connectivity define a Smart System
- Smart Systems combine different functionalities to an autonomous IoT node

COMPETITIVENESS OF THE EU IN ELECTRONIC COMPONENTS AND SYSTEMS

- European sensor technology defies the US and Asian dominance in semiconductors
- System integration requires investments in hardware, software and cloud technology:
  - leverage the competitive advantage at a system level

Thank you!

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