

# NEXT GENERATION IOT

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Bosch Software Innovations GmbH



# IOT IS BECOMING UBIQUITOUS

IP-enabled  
product classes at Bosch

**~50%**

in 2016

IoT market  
presence

**27 mio**

Bosch-enabled IoT devices in 2016

IoT solutions  
powered by  
Bosch IoT cloud

**70**

in 2016



# BUSINESS GROWTH POWERED BY IOT



MANUFACTURING  
LINES

100s



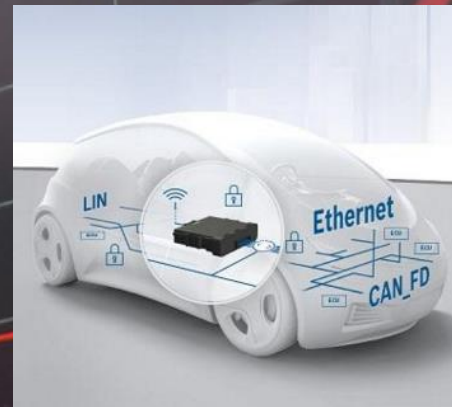
BOILERS

10.000s



RETROFIT ECALL

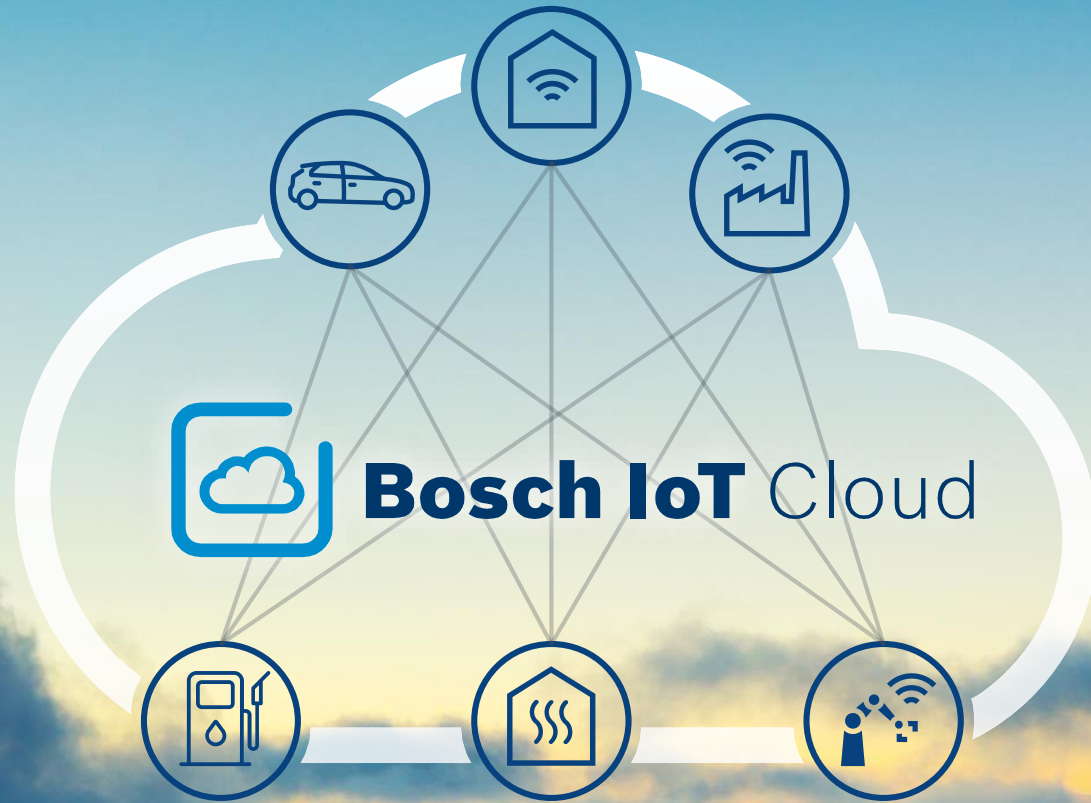
100.000s



IN-VEHICLE  
CONNECTIVITY UNITS

1.000.000s

# FOUNDATION



**Services**



**Software**



**Sensors**



# Example IOT Project: HUK INSURANCE

SmartDriver program rewards safe driving



**HUK-COBURG**

Aus Tradition günstig

## Largest German car insurance

- ▶ 11 Mio. customers
- ▶ €6.6 bn revenue (2015)



## Innovative Solution

- ▶ Insurance rate based on driving behaviour
- ▶ Leverage telematics and Bosch IoT Cloud

# Example IOT Project: HUK INSURANCE

SmartDriver program rewards safe driving

**Sensors**



**Software**



**Services**



Acceleration and  
breaking data



**Bosch IoT** Cloud

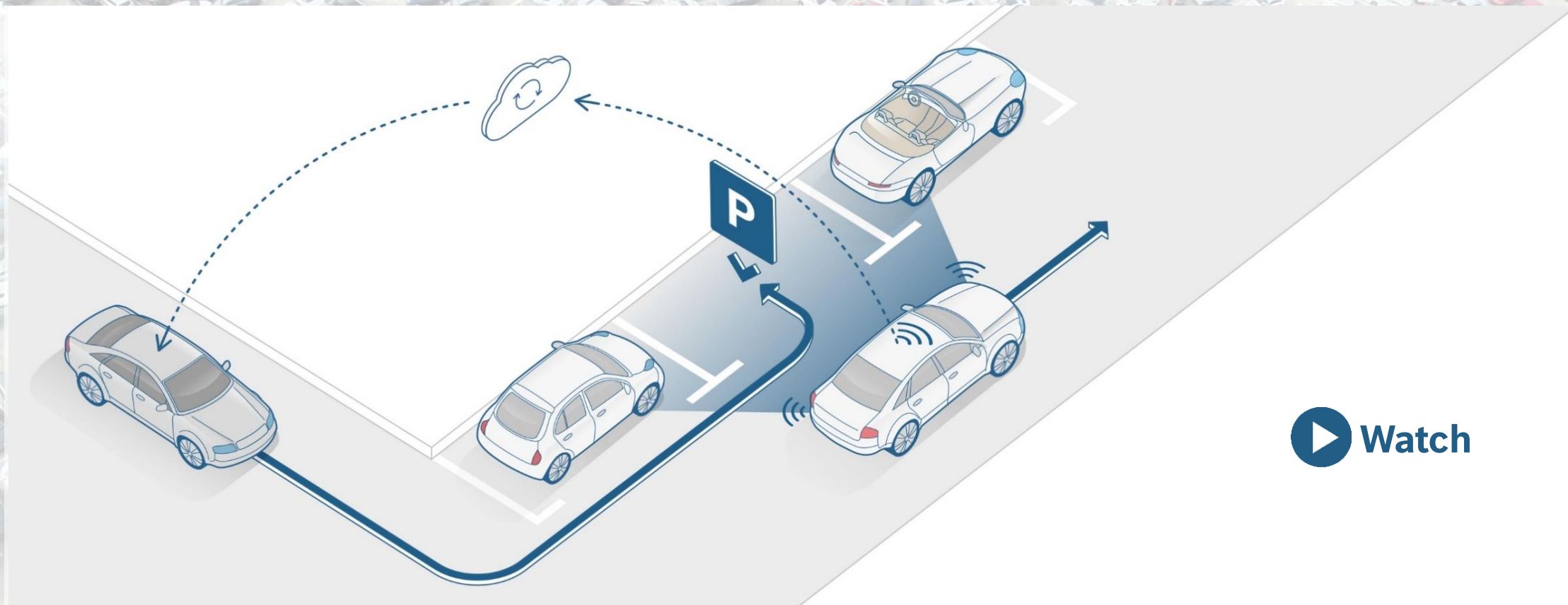


Insurance rate based on  
driving behavior plus  
eCall service



# Example IOT Project: COMMUNITY-BASED PARKING

Finding a parking space becomes a shared endeavor





# Example IOT Project: COMMUNITY-BASED PARKING

Finding a parking space becomes a shared endeavor

**Sensors**



**Software**



**Services**

**Ultrasound  
Sensors**



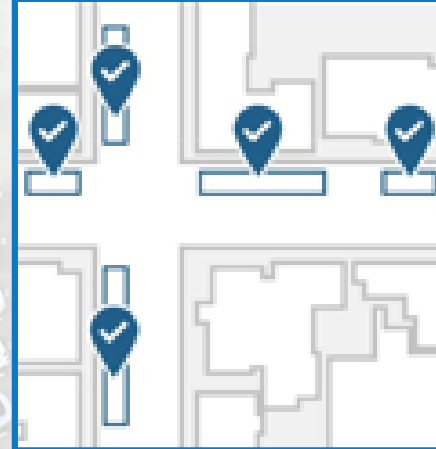
**Sensor Data  
Analytics**  
(Parking Spot  
Identification)

**OEM  
Cloud**

Anonymized

**Parking Map  
Generation**

**Parking Services**



**Bosch IoT Cloud**



# TECHNOLOGY DRIVES INNOVATION

# NEXT GENERATION IOT

Emerging technologies enable new use cases



Cloud & Fog  
Computing

Blockchain



**Services**



**Software**



**Sensors**



IOT Networks

Artificial Intelligence  
& Deep Learning





# CLOUD AND FOG COMPUTING

Intelligence and data distributed between asset and cloud

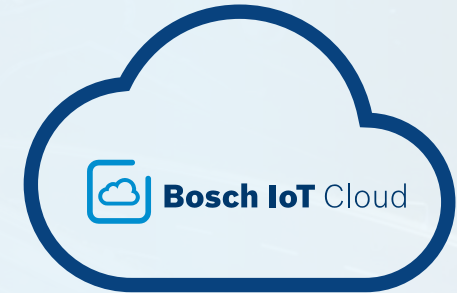
## Fog Computing



**Flexibility!**



## Cloud Computing





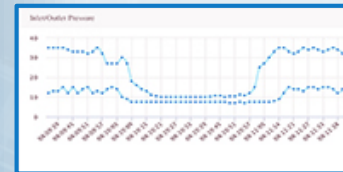
# CLOUD AND FOG COMPUTING

Intelligence and data distributed between asset and cloud

## Fog Computing



**FOG**HORN



- ▶ Pre-analyze data on asset
- ▶ React in almost real time
- ▶ Minimize data volumes sent to backend

 **ProSyst**<sup>®</sup>

- ▶ Cloud-like features on asset:
  - Dynamic deployment of new software services via FOTA
  - Efficient management of runtime behavior



# IOT NETWORKS

Specialized networks support different IoT use cases

## Many IoT use cases not ideally supported by GSM networks

### Key Issues

- ▶ Network coverage
- ▶ Power consumption
- ▶ Latency / real-time capabilities
- ▶ Cost

## Dedicated IoT networks address these issues

- ▶ Satellite
- ▶ Low-power WAN (LPWAN/LoRa)
- ▶ Narrow-band (NB-IoT)



### Connectivity Cost / Device

GSM/  
LTE

LPWAN

GSM/  
LTE

LPWAN

### Battery Efficiency

### Latency

GSM/  
LTE

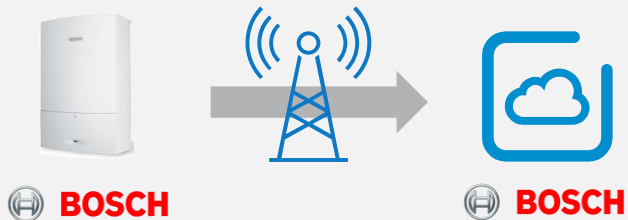
LTE-  
V2X/  
ITS.G5



# IOT NETWORKS – USE CASES

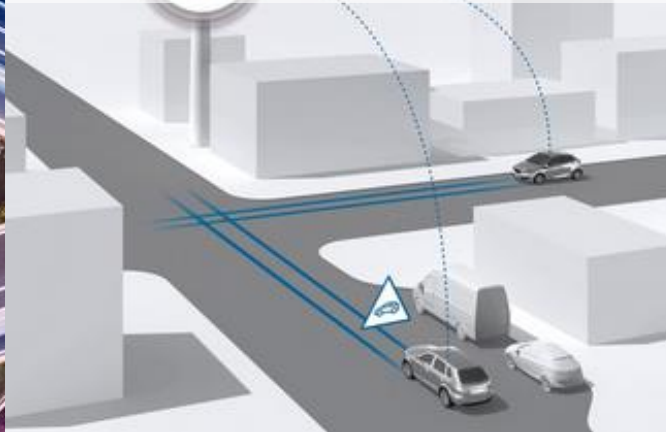
Bosch capabilities and partners

## Example 1: LPWAN



↓ Connectivity Cost / Device

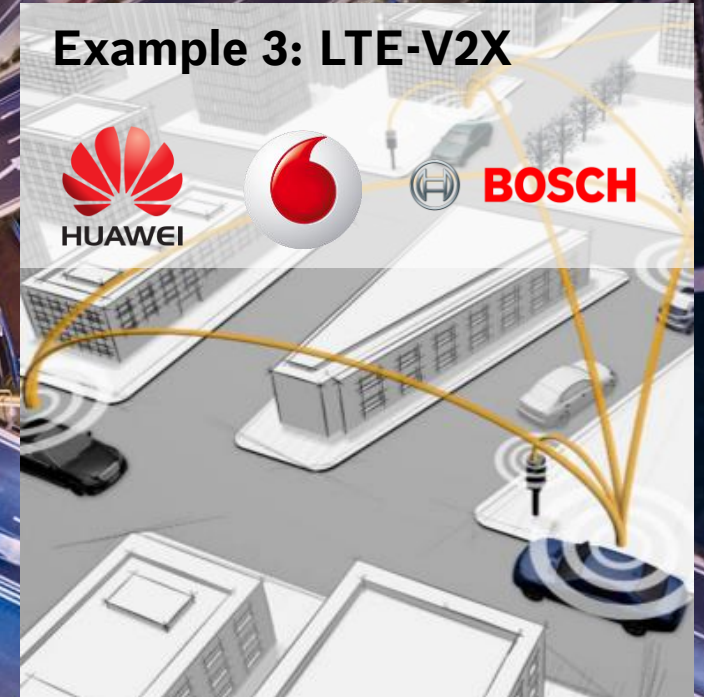
## Example 2: Mobile Edge Computing



↓ Latency

↑ Throughput

## Example 3: LTE-V2X



↓ Latency

Peer-to-Peer ✓



# THE BLOCKCHAIN

Establishing trust in heterogeneous partner ecosystems

## Blockchain

- ▶ Distributed database („ledger“)
- ▶ Chained list of data „blocks“
- ▶ Resistant to modification of data

## Use Cases

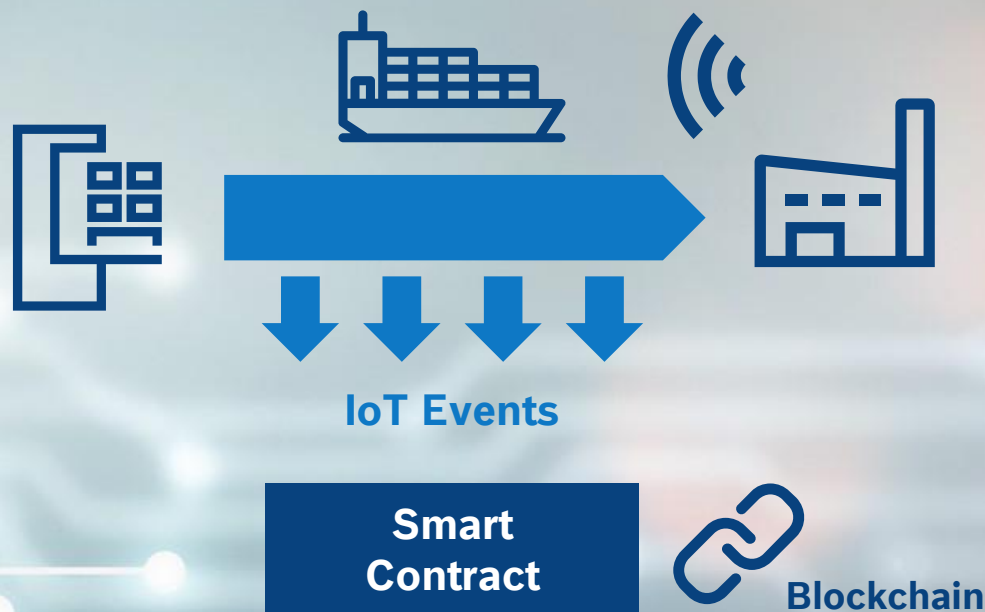
- ▶ Finance: Bitcoins
- ▶ Industry: smart contracts, product identity, anti-counterfeit

## Blockchain & IoT

- ▶ Immutable sensor data, for instance product usage and location

### Example:

Delivery confirmation in Smart Contract via IoT event triggers payment



# ARTIFICIAL INTELLIGENCE

Bosch uses artificial intelligence to turn things into intelligent assistants

## AI Characteristics

- ▶ Self-learning systems
- ▶ Based on neural networks

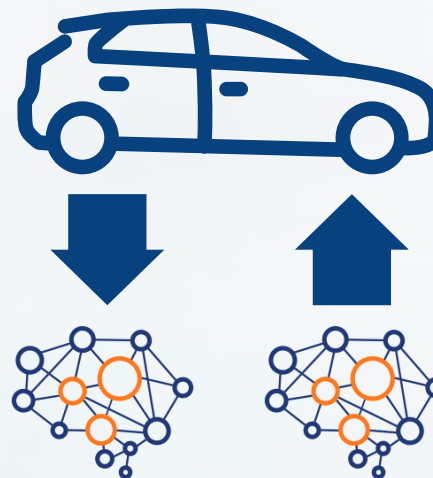
## Application Areas

- ▶ Perception-action-loop
- ▶ Trajectory Planning
- ▶ Predictive maintenance
- ▶ Autonomous cars and robots

## Bosch Perspective

- ▶ Impact on many Bosch products
- ▶ Key focus area for Bosch

**Analytics:**  
predictive and  
preventive



**Control:**  
autonomous cars  
and robots



# BOSCH AND AI

Bosch uses artificial intelligence to turn things into intelligent assistants



**Foundation of Bosch Center for Artificial Intelligence (Palo Alto, Bangalore, Renningen)**

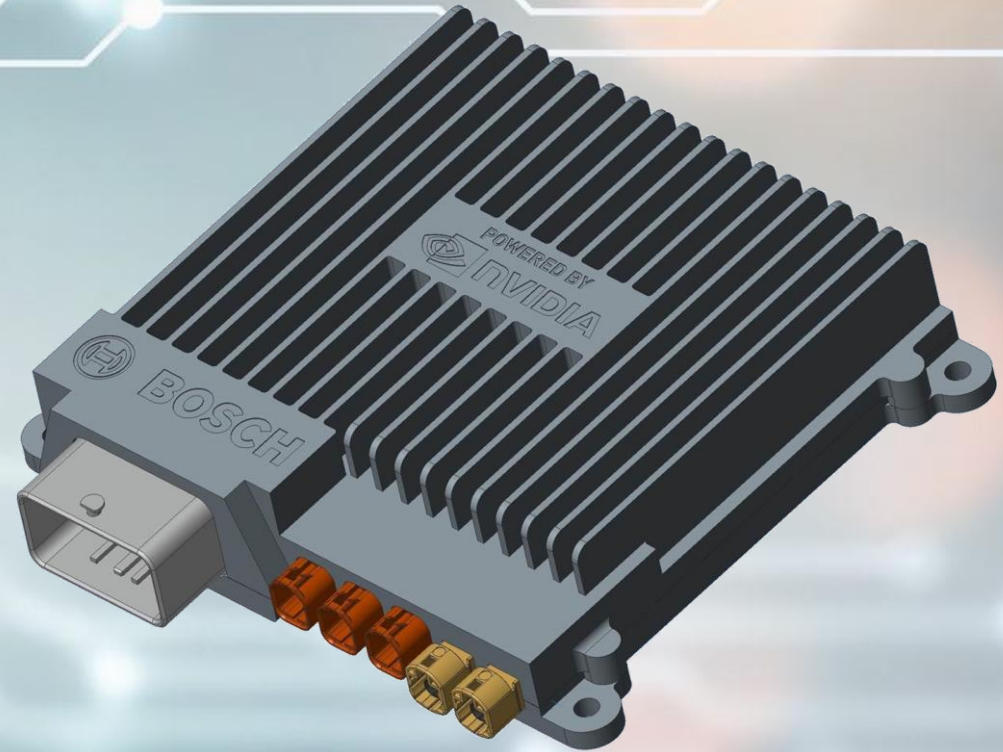


**Bosch partners with Academia: Cyber Valley Tübingen/Stuttgart**

# WORLD'S FIRST AI CAR COMPUTER

## Announced at #BCW17

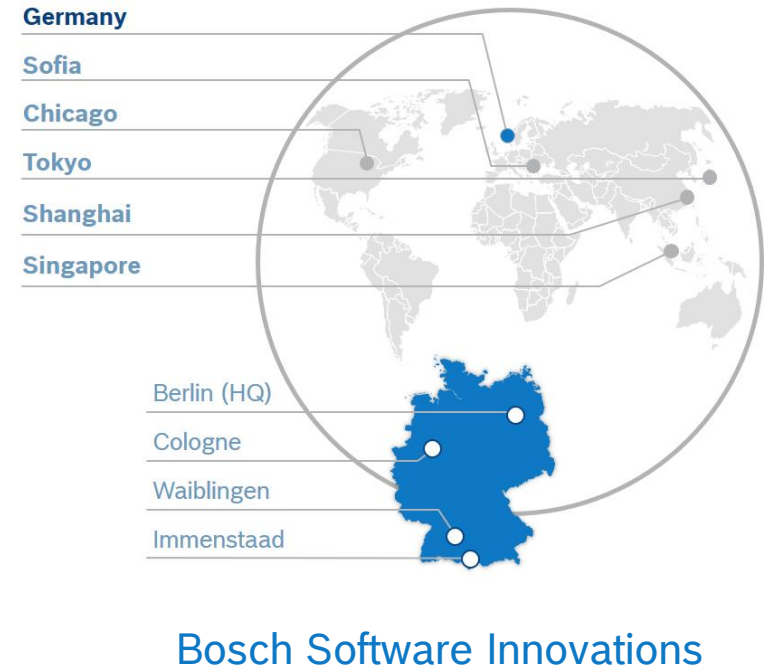
- ▶ Bosch AI Car Computer
- ▶ Leveraging latest NVIDIA chip set
- ▶ Foundation for autonomous driving
- ▶ Using advanced AI algorithms for complex traffic situations
- ▶ Major stepping stone towards fully autonomous vehicles





# More than just a job

## Career opportunities at Bosch



**Career information: [www.bosch-si.com](http://www.bosch-si.com)**

# THANK YOU FOR YOUR ATTENTION!

## **Bosch Software Innovations GmbH**

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