IOT FLAGSHIP PROJECT

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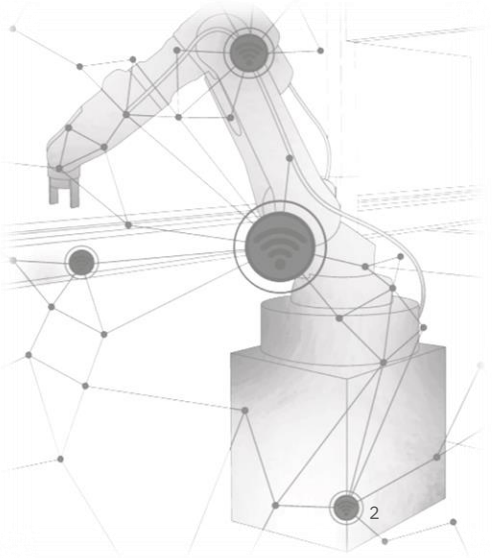
Challenge

Digitalization over the entire product lifecycle **accelerates** the development, validation, instrumentation and deployment of complex industrial products while **increasing product quality**.

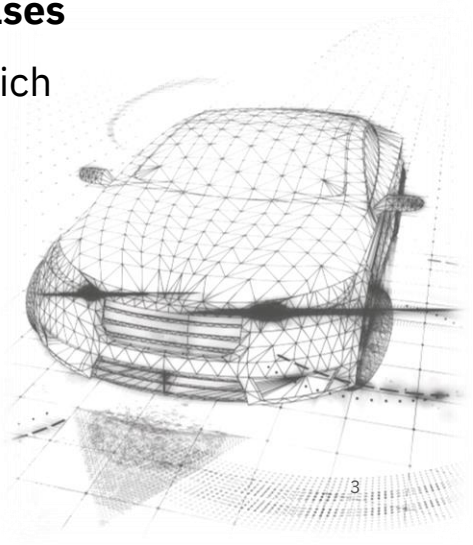
The digitalization and **increasing connectivity** of (critical) cyber-physical objects enables development of **new applications** but also leads to **new safety & security related requirements** in the design, testing, production and operation of these systems.



Vision

IoT4CPS will support **digitalization along the entire product lifecycle**, leading to a **time-to-market acceleration** for connected and autonomous vehicles.

IoT4CPS will provide **innovative components**, leading to **efficiency increases** for the deployment of level 3 and level 4 autonomous driving functions, which will be validated in a **vehicle demonstrator**.



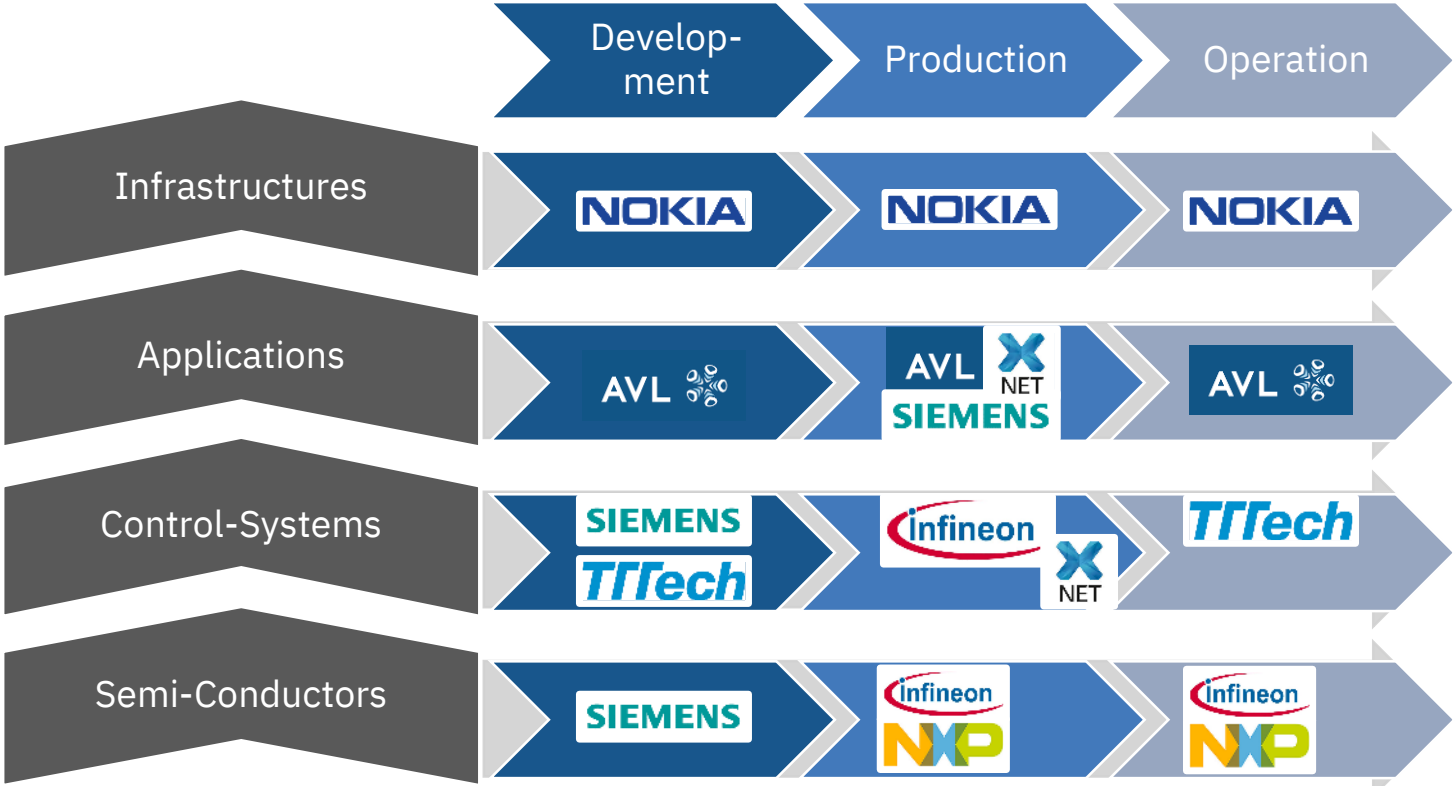
Key Facts

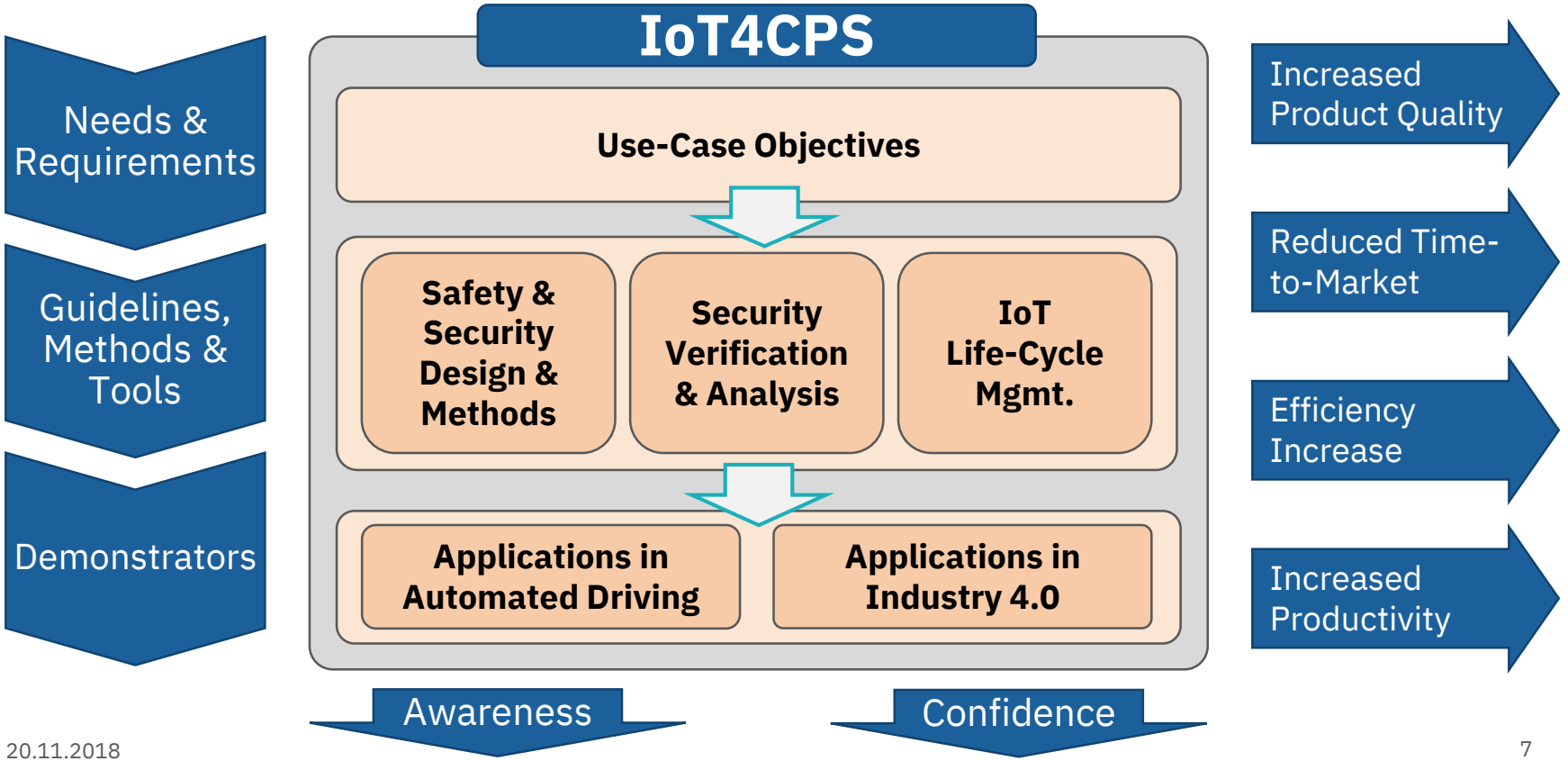
- Austrian Flagship Project on **„Internet of Things - Safe, Secure and Usable”**
- >5 Mio. € overall budget
- 3 Mio. € public funding
- Partially funded by the **“ICT of the Future” Program** of the
  Austrian Research Promotion Agency (FFG) and the
  Austrian Ministry for Transport, Innovation and Technology (BMVIT)
- **16 Austrian project partners**
- Strong link to European initiatives
- >80 project members
- Project duration from Dec. 2017 – Nov. 2020 (36 month)

Consortium

- Consortium of **Austrian industry partners** covering the major aspects of the **CPS value chain**
  - Semiconductors (Infineon, NXP)
  - Control systems (TTTech, AVL)
  - Applications – automotive, production (Siemens, AVL)
  - Infrastructure, connectivity (Nokia, X-net)
- Consortium of **scientific partners across Austria** covering the **key technology innovations**
  - Wien: AIT, TU Wien, SBA Research
  - St: Joanneum Research, TU Graz
  - OÖ/Sb: Salzburg Research, SCCH, JKU Linz
- Consortium leader (AIT)

Partners along the value chain

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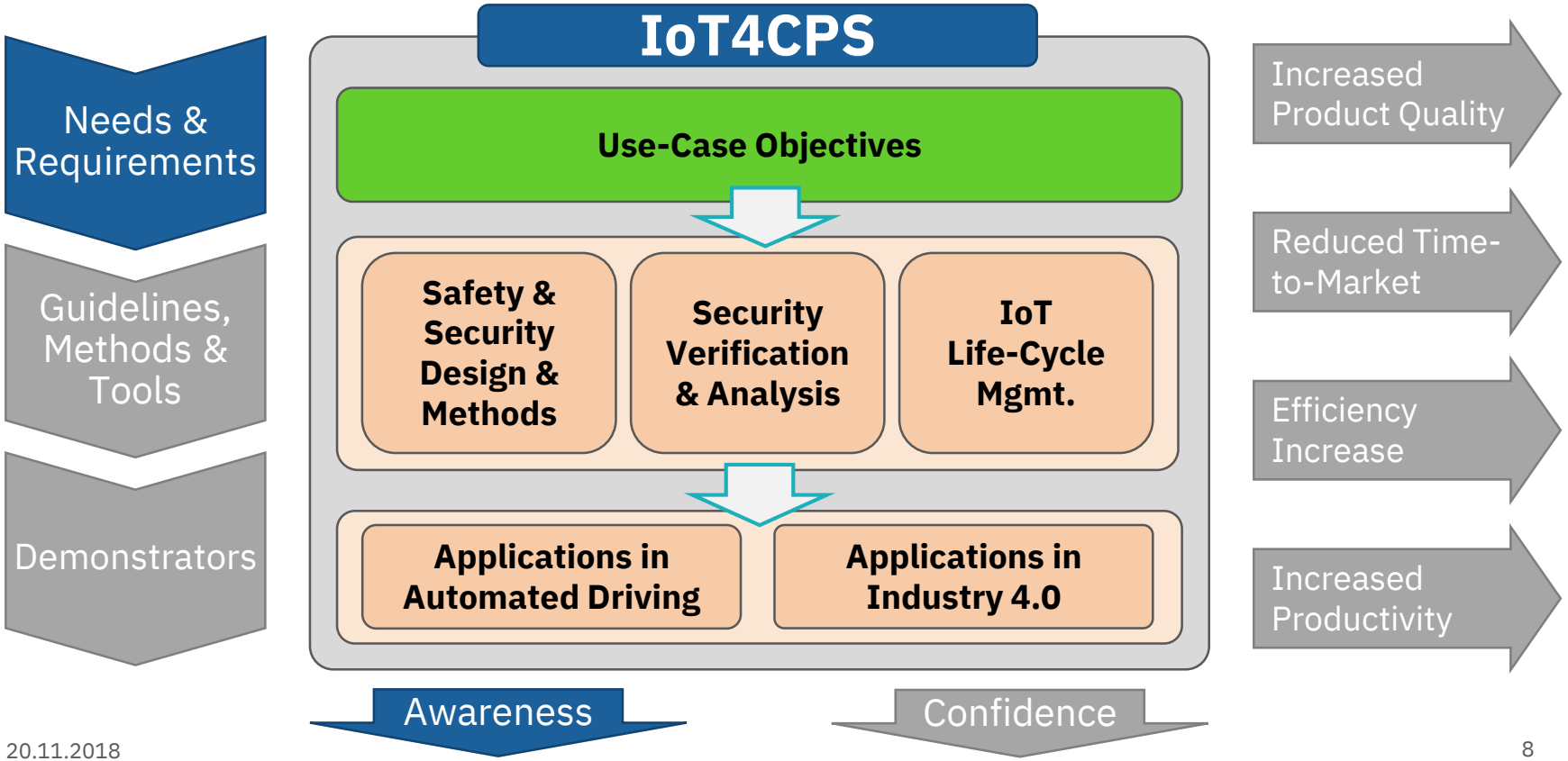
Demonstrators
IoT4CPS
Use-Case Objectives
Safety & Security Design & Methods
Security Verification & Analysis
IoT Life-Cycle Mgmt.
Applications in Automated Driving
Applications in Industry 4.0
Awareness
Confidence
Increased Product Quality
Reduced Time-to-Market
Efficiency Increase
Increased Productivity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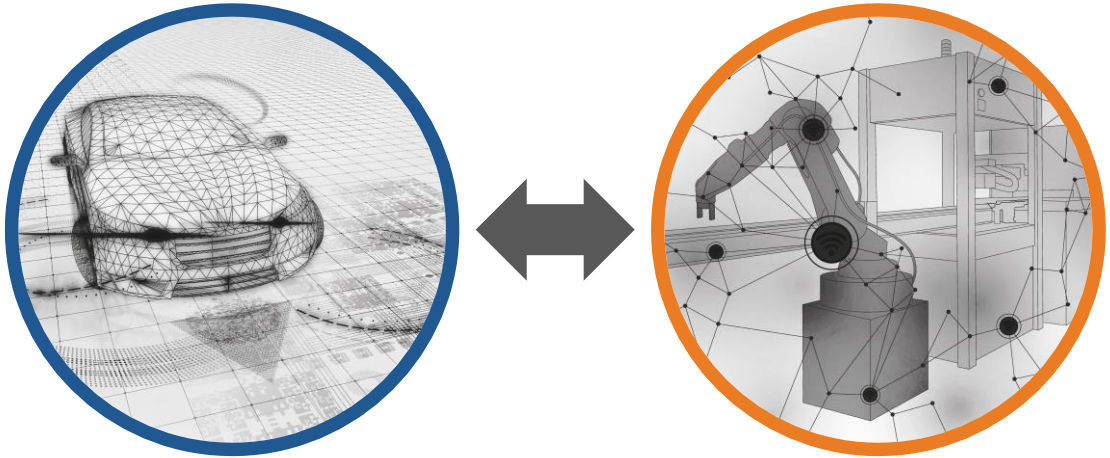
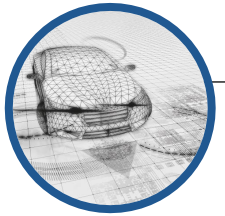
Focus on two Use-Cases



Automated Driving

Industry 4.0



Automated Driving – Needs

Demonstration and evaluation of technologies needed for **automated driving**

Execution of safety-related automated driving functions

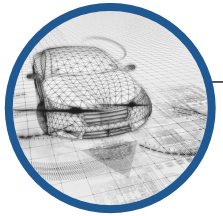
- Critical interplay between high-performance and safety requirements
- Fast and deterministic communication needed
- **Fail-safe is not enough**

Secure and reliable V2X communication

- **The connected car is a cybersecurity nightmare**
- Dealing with interference between security and safety properties

Smart in-vehicle instrumentation

- Instrumentation solutions for **driveability assessment** of connected and automated vehicles
- Smart and secure services enabling better scheduling and maintenance of automotive test-beds, finally leading to increase of throughput



Automated Driving – Innovation

Focusing on three main aspects of **automated driving development**

Execution of safety-related automated driving functions

- Efficient integration and execution of **safety-related automated driving functions**
- Time-triggered, real-time execution and scheduling
- **Freedom of interference** through virtualization

Secure and reliable V2X communication

- **5G** 28 GHz transceivers
- **Behavioural models** for the HW and specifications for secure communications

Smart in-vehicle instrumentation

- Accessing **vehicle interfaces** and integration of connectivity solutions
- Integration of **trustworthy IoT** methods

Industry 4.0 – Needs

Focusing on three main aspects of smart manufacturing environment

Secure Connectivity

- Ethernet or Fieldbus connectivity, mature but inadequate
- Need for scalability & high diversity of large-scale IIoT ecosystems due to **many connectivity scenarios**
- Security, ultra-low latency, reliability, data throughput is of paramount importance

Lifecycle Traceability

- RFID based traceability must be enhanced
- Need for customized solutions for complex and heterogeneous IIoT environments
- Increased complexity of related IT solutions for an overall optimized and **secure IIoT architecture**

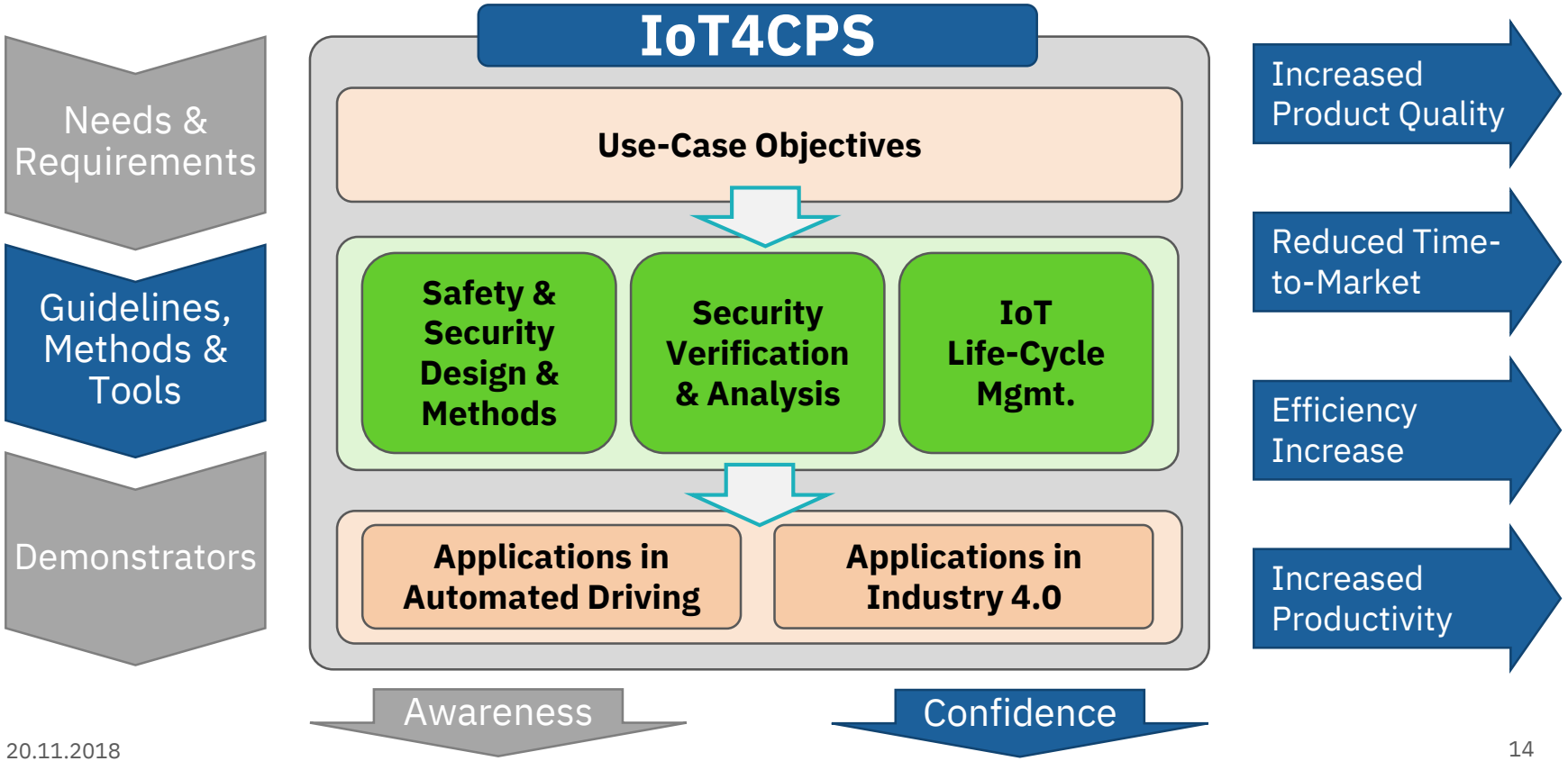
Security by Isolation

- Machinery controlled by different types of OS, SW
- **Closed source technologies**
- Upgrades & updates are very difficult to impossible
- Connect machinery, robots and lines and link them with sensors and software to provide all necessary functionalities

Industry 4.0 – Innovation

Methods and tools developed in WP3,4,5 will be integrated into WP7 activities to demonstrate the impact in the **digitalization of industry**

Secure Connectivity	Lifecycle Traceability	Security by Isolation
• **Trustworthy connectivity** solutions for IIoT environments • General and behavioral HW models that satisfy major IIoT connectivity priorities • Specs for secure, reliable & robust **I4.0 communications**	• **Holistic & secure traceability** along the entire production & product lifecycle • Secure **cryptographic implementation** & verification concepts • Aspects of interoperability, authenticity, privacy	• Methods for **secure IoT products** & for **secure** set-up of **production environments** • Implementation of testbeds and development of open access guidelines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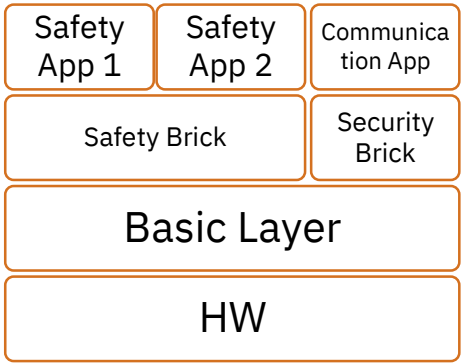
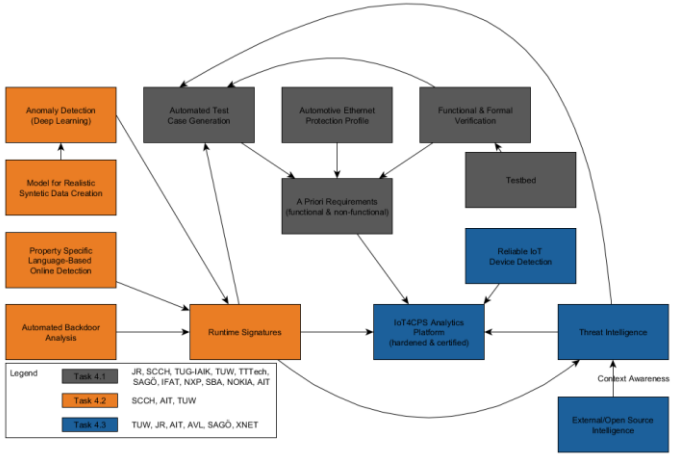
Safety & Security Design & Methods

- Dependability engineering **methods & guidelines**
- **Building blocks** for safe and secure IoT
  - HW/SW architecture patterns
- **Crypto algorithms** for IoT
  - Guidelines and implementation
- **Usable security**
- Provide concepts and tools for integration in the **industrial demonstrators**



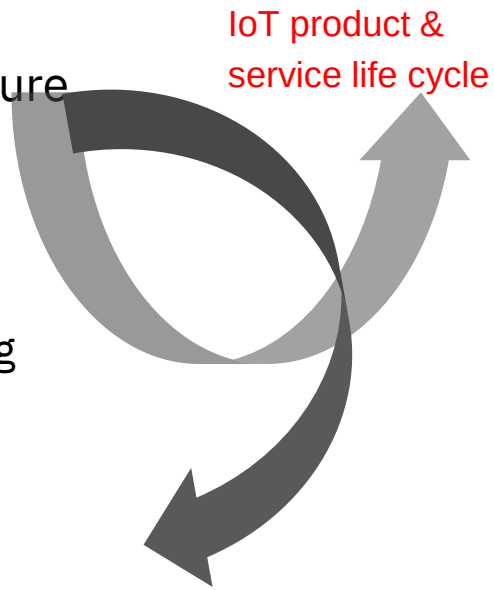
Security Verification & Analysis

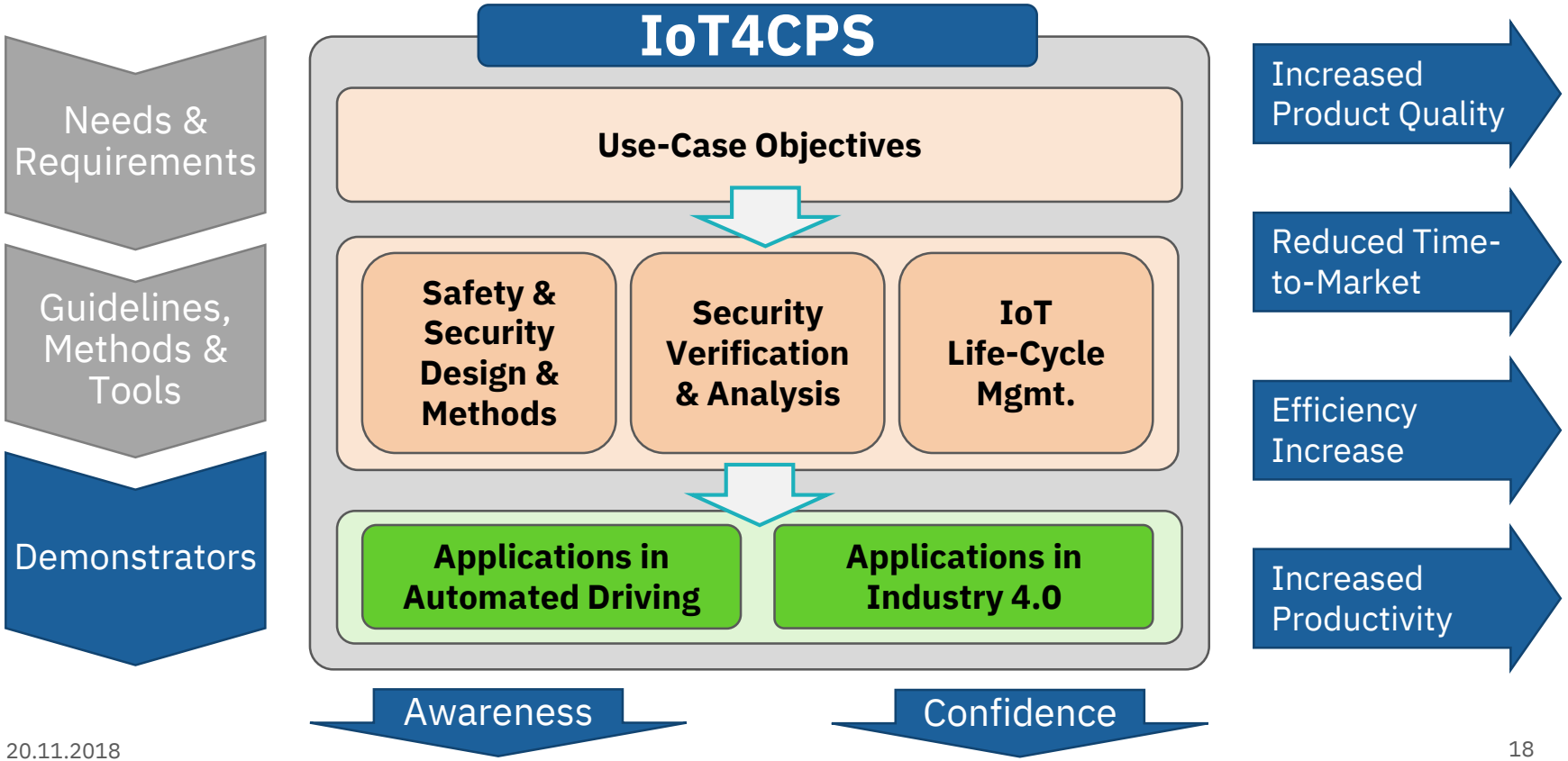
- **Static analysis** (guideline documents)
  - Functional and formal testing
  - Automated test case generation
  - Automotive Ethernet protection profile
  - Low power hardware property checkers
- **Dynamic analysis** (software toolbox)
  - Intelligent security measures (e.g., machine learning based online side-channel parameter analysis)
  - Online anomaly detection
  - Reliable device detection
  - Online verification of communication behavior/protocols (property based specification language assertions)



IoT Life-Cycle Management

- **Domain knowledge models for Digital Twins** to be captured though the IoT product and services life cycle and through the orthogonal cybersecurity life cycle
- **Digital Twin demonstrator** (data analytics infrastructure methods and tools)
- Increase in the efficiency of **Digital Twin-based methods and tools**
  - for security, privacy ad safety performances of the existing IoT-based systems and
  - for better safety features of new IoT-based product and service design and configuration

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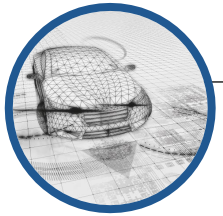

Automated Driving Demonstrator

Methods and tools developed will be integrated to demonstrate the **impact on automated driving solutions**

Execution of safety-related automated driving functions	**Secure and reliable V2X communication**	**Smart in-vehicle instrumentation**
• Next-generation of safe, secure and high-performance platform for **SAE level 4** or even level 5 automated driving	• Report on the capa-bilities and limitations of HW transceiver modules that offer secure and **reliable V2X connectivity**	• Accessing vehicle interfaces and integration of connectivity solutions **➓➔ connected powertrain**

Industry 4.0 Demonstrator

Integration of the achieved results, methods, tools & guidelines for a **demonstration in actual test factories** (e.g. engine development facilities at AVL)

I4.0 Demonstration Platform

Integration into development & validation platforms

Include CPS that are part of the vehicle itself to follow the **full life-cycle approach** (close the loop to vehicle maintenance and an iterative design process)

Develop **suite of solutions** enabling integrity & authenticity check of complex systems and secure multi-technology wireless connectivity solutions in automotive industry tailored for in-vehicle instrumentation or integration in (V&V) system

Consider **industrial requirements**, according lifetime & specific challenges

Thank you!

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Projectpartner

The IoT4CPS project is partially funded by the “ICT of the Future” Program of the FFG and the BMVIT.