

smart4i Next Generation

The new smart4i *Next Generation* Demonstrator makes Industrie 4.0 tangible and proves that even today, manufacturing processes can be made suitable for Industrie 4.0 through the efficient use and combination of technical components. Thanks to the new smart4i *Next Generation* Demonstrator, clients have the opportunity to order a customisable miniature car (colour, vehicle type, Augmented Reality Experience). The order is processed directly by the demonstrator and the corresponding parameters are passed on to the modules. There is a special feature here: the integrated networking from the cloud to the field devices, which is ensured at all times by uniform interfaces (OPC UA) and information models.

Project goals:

- **Making Industrie 4.0 tangible:** Illustrate complexity and interdependencies with a concrete project example
- **Prototype development:** Implementation of a modular manufacturing plant as a vivid fair exhibit for individualizing cars
- **Practical education:** Interdisciplinary project work in a team and in cooperation with industrial partners
- **Tool-based systems engineering:** Application of agile mechatronic development methods, e. g. Scrum, and tool-based engineering

Supported by:



The Team

In only 6 months, an interdisciplinary and international team of 25 highly motivated students has realised the new smart4i *Next Generation* Demonstrator. The students are from different universities (Munich, Aalen, Augsburg).



About ITQ GmbH

ITQ GmbH consults and supports during all phases of software development, allowing for special mechatronic problems in mechanical engineering. The core competencies, besides software engineering (comprising analysis, design, implementation and test) are process improvement, project and crisis management as well as consulting and coaching. One particular focus of the company are sustainable training concepts that shape the future. For that reason, the company fosters young academics in practice-oriented assignments such as the project „smart4i *Next Generation*“.

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competence in mechatronics
software and systems engineering

smart4i Next Generation



Industrie 4.0 \ Demonstrator

The Project

From the Cloud to the personalized car

- Individual products: Batch size 1
- Real-time order tracking
- Directly from the internet to the shop floor
- Highly modular design
- Provision of two different product ranges plus Augmented Features
- Uniform OPC UA interfaces
- Service-based control for fast and easy operation replacement of modules
- Interaction of virtual and real modules (Digital Twin, Augmented Reality)

Transport Module (B&R SuperTrak)

B&R/ITQ

- Transport of wrapping and cars between modules or rather production stages
- Individual movement of the “pallets” on which the wrapping (blister) and the cars are mounted

Joining Module

Herrmann Ultraschall/Mitsubishi Electric/ITQ

- Conjunction of chassis and underbody with ultrasonics
- Transfer of the joined product to the transport system

Modularity and Communication

- Functional abstraction of the individual modules using “skills”
- Uniform platform-neutral information model, implemented using an OPC UA interface

Project Management

ITQ

- Organization, coordination and coaching of an interdisciplinary and international team
- Definition and monitoring of the agile development process

Order in the Cloud

- Customers can enter their order via internet, and the order is immediately saved in a Cloud platform
- The individual cars are changed directly on site using a digital mock-up application or via Augmented Reality with additional features
- The Demonstrator's order management and process control gather the orders directly from the Cloud and relay the parameter values to the modules

Milling Module

iwb/ITQ

- Milling an individually designed body
- Parallel display of a milling simulation

Packaging Module

Herrmann Ultraschall/ITQ

- Packing all manufactured cars with ultrasound technology
- Display of the joining parameters



Body Module

B&R/ITQ/iwb

- Removing the bodies from the storage system
- Loading on a pallet of the transport system
- Use of a Comau robot and a self-developed gripper system controlled by B&R hardware

Output Module

Hochschule Aalen

- Intermediate storage and extraction of the finished orders from the Demonstrator
- Ejection of the order by pushing the button

