The project receives grants from the European H2020 research and innovation programme, ECSEL Joint Undertaking, and National Funding Authorities from 19 involved countries under grant agreement no. GAP-737459 - 999978918.
Positioning the project

EC Horizon2020

ECSEL Electronic Components and Systems for European Leadership

ECSEL Innovation Action & 1st Lighthouse: Industry4.e

Electronics and ICT as enabler for digital industry and optimized supply chain management covering the entire product lifecycle

K. Hufeld, short overview, Neubiberg, 26.01.18
ECSEL Lighthouse Industry 4.E

- An umbrella for all Industry Digitalization related activities in the field of Electronic Components and Systems
- A communication platform for all stakeholders facilitating the cooperation and reducing fragmentation.
- A link towards the respective national and regional activities in the field
- A social impact and uptake accelerator of project results.
- A powerful channel towards specialized and general public.

Light house session Industry 4.E During the project conference of productive4.0

EFEC 20 - 22. November 2018 Lisbon
Scope of the project

ECSEL Innovation Action Project  TRL5-8

IoT-enabling HW/SW: sensors, actuators, communication, security, embedded computing

Analysing methods and modeling of Big data

Secure realtime data processing  Manufacturing automation

Supply chain management, Big data handling

Fab/Supply chain virtualisation and simulation

Production planning & control, Logistics, Maintenance

Production use-cases

Scope of Productive 4.0

Research  Product Development  Manufacturing  Product In-use  Recycling

K. Hufeld, short overview, Neubiberg, 26.01.18
Main objective of the project

Significant improvement in digitalising the European industry by means of electronics and ICT.
- aiming at suitability for everyday application
- various industrial domains with same approach of digitalisation.
• Key partners:
  BMW, Philips, Infineon, ABB, NXP, STM, BOSCH, Thales, AVL, VOLVO, CEA, BetterSolutions, IMA, KIT, AIT, FhG, Sysgo, DANOBAT, MONDRAGON,ERICSSON, VTT, SINTEF, LTU, LFOUNDRY, TNO, TTTech, Siltronic, VIF and many more..

• Key industrial domains:
  Automotive,
  Machinery,
  Robotics,
  Semiconductor & Electronics,
  Consumer,
  Automation,
  Logistics
..a structured European consortium indeed..

- 109 Partners
- 19 countries
- 65% Industry
- Budget: 106 Mio €
- JU funding: 26 Mio €
- Total grants: 51Mio €

- Well balanced across ECSEL communities:
  - 45% AENEAS
  - 30% ARTEMIS-IA
  - 25% EPOSS

approx. 65% HW electronics; 35% system architecture, methods and tools
a hands-on approach of digitalising the European industry with focus on the three pillars:

- Digital production (DP)
- Supply Chain Networks (SCN)
- Product Life Cycle Management (PLM)
Project Structure – towards reference implementations

K. Hufeld, short overview, Neubiberg, 26.01.18
1) Furnish the Digital Industry with SoS-based architecture platforms
Project Structure

1) Furnish the Digital Industry with SoS-based architecture platforms

2) Set up a data analytics framework and a secure communication environment
Project Structure

1) Furnish the Digital Industry with SoS-based architecture platforms
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3) Provide the industry with IoT-enabling components
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9) Implementation of reference product use cases for the different industrial domains
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K. Hufeld, short overview, Neubiberg, 26.01.18
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# Project Management

## Overview

### Project Phases and Major Project Milestones

<table>
<thead>
<tr>
<th>Milestones</th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
</tr>
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<tbody>
<tr>
<td>M1</td>
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<td>M2</td>
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<td>M8</td>
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</table>

<table>
<thead>
<tr>
<th>Project phases</th>
<th>1st innovation cycle</th>
<th>2nd innovation cycle</th>
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</thead>
<tbody>
<tr>
<td>Requirements, specifications</td>
<td></td>
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<tr>
<td>Concepts identification &amp; architecture definition</td>
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<td></td>
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<tr>
<td>Development</td>
<td>1st evaluation</td>
<td>Integration</td>
</tr>
<tr>
<td>Integration</td>
<td>Eval</td>
<td>Optimization</td>
</tr>
<tr>
<td>1st evaluation</td>
<td>Implement</td>
<td>Demo</td>
</tr>
<tr>
<td>Optimization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation</td>
<td></td>
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<tr>
<td>Final evaluation &amp; demonstration</td>
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</tbody>
</table>

Automation and Digitisation Pilot Lines

WP8 Tier3 Pilot Lines
WP8 Tier2 Pilot Lines
WP8 Tier1 Pilot Lines
WP8 OEM Pilot Lines

WP9 Product - Use case1
WP9 Product - Use case2
WP9 Product - Use case x

Automotive (e.g. BMW)
Shaver (e.g. Philips)
Machinery (e.g. Danobat)

Supply Chain Networks

Tools/ Materials
Semi
System
OEM

K. Hufeld, short overview, Neubiberg, 26.01.18
Automation and Digitisation Pilot Lines

OEM use cases:
- Integration of vehicle individualization in a highly automated assembling process in the Automotive Industry in the logistics based on Product Lifecycle Management Systems (BMW, EDMS)
- Flying robots (BMW, IEMTEC, KINEXON, FAU FAPS)
- Industrial IoT/CPS System (VTC, ERICSSON, LTU, SEB)
- Tracking, sensing and actuating services (IMA)

Tier1 Use Cases
- Smart services for test equipment (AVL)
- Simultaneous Cost Engineering for powertrain architectures (AVL)
- Smart Services for Traceability
- Manufacturing Systems
- Supply chain management for semiconductor manufacturing (BOSCH)
- Smart failure analysis lab (IFAT)

Tier2 Use Cases
- MES of the future (IFD, SYSTEMA)
- High Automation Solution in SC Wafer production line (Siltronic, SYSTEMA)
- Data Analytics, Semiconductor Data Lake (SYSTEMA, IFD)
- Fab robotization (ST ROUSSET)
- Factory Supervision for variability reduction (ST CROLLLES)
- Adaptive mobile robot systems for smart manufacturing (HOST, IFD)
- Smart Semiconductor Fab Automation by Flexible Autonomous Robots with Advanced Handling Functionality (IFD, IFAT, IISB)
- Smart, adaptive and intelligent substrate handling (IFD, ZS-Handling, Xenon, HOST)
- Automation frame work for new equipment without automation standards (IFD, Xenon)
- Automation frame work and automation strategies for advanced carrier cleaning procedures for semiconductor substrates (IFD, Pfeiffer-Vacuum, FhG IISB)
- Real-time based, Global and Local production Optimizations “RIGLOS”, (SYSTEMA, Ifineon)
- Optimization network using advanced scheduling (IFD, TUD)
- Modern outlier detection methods for semiconductor manufacturing (IFD, TUD)
- Management of Automated Fab Control, Tasks and Decisions (IFD)
- People in a 4.0 digitalized manufacturing area (Change Management) (IFD)
- Single device tracking and advanced process control in assembly and packaging for system integration (IFAG)

Use cases along the supply chain
- Shaver system use case (PCL)
- Extended Product Lifecycle Management Best Practice (Thales NL)
- Machine tool digitization (IFAT, MONDRAGON, IDEKO, SAVVY, ULMA, MGEP)
- Chemical production digitization (Savio, EPIF, TellU, SINTEF)
- Camshaft Proactive Manufacturing (EPC, Innovalia, TRIMEK, TTT, MGEP, TWT, AIT)
- Machine and fleet management offered as industrial services (VTT, TUT, WAPICE, CC, Metso, Konecranes)
- Virtual production planning and control of a semiconductor supply chain at Bosch (BOSCH)
- Digital Production of ETO Luminaires (PLV)

Use cases
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OEM use case: flying robot

The flying robot is Developed by IEMTEC, Kinexon and University of Erlangen-Nuremberg FAPS, it is subject of a use case together with the car manufacturer BMW Group in work package 8.

- Diameter one meter, can carry a payload of up to 13 kg
- positioning in an indoor area is the challenge and first flights have been successfully performed
easy to use online finder tool for comparing semiconductor products in an application context visualized by block diagrams and combined with simulation.

Prepared for 10,000 semiconductor products

https://solutionfinder.infineon.com/application/en
**Thin wafer Handling / Robotics**

**Tier2 Use Case**

- **Content of the UseCase**
  - Enabling semiconductor manufacturing for new substrate types assuring stable production
  - Realization of automation frame and integration of smart handling especially for critical substances with different wafer thickness

- **Technological need for thin wafer**
  - Thinner Wafer reduces on state losses (static and dynamic) for IGBT → need for thinning
  - Front and backside of the wafer are electrical active → no damage on the surfaces aloud

**More results:**

EF ECS 20. - 22. November 2018 Lisbon
WP2  Environment for Digital Industry

T2.1  Interaction with other work packages
T2.2  Data Analytics and Handling services
T2.3  Secure Communication networks
T2.4  Data security
Security is protecting essential values

Espionage/Fraud

- Know-how and R&D investments
- Competitive loss

Sabotage / Cyber War

- Physical damage
- Financial liabilities
- Reputational impact

Selected security use cases

- Anti-counterfeiting
- Intellectual Property (IP) protection and feature activation
- Remote maintenance
- Infrastructure security
Basic functions and security targets

<table>
<thead>
<tr>
<th>Main target</th>
<th>Security target</th>
<th>Security basic function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical &amp; logical separation of LAN, WLAN, other networks</td>
<td>Confidentiality</td>
<td>Secure Authentication</td>
</tr>
<tr>
<td></td>
<td>Integrity</td>
<td>Authorisation</td>
</tr>
<tr>
<td></td>
<td>Availability</td>
<td>Encrypted</td>
</tr>
<tr>
<td></td>
<td>Verifiability</td>
<td>Data transfer</td>
</tr>
<tr>
<td></td>
<td>Legal certainty</td>
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</tr>
</tbody>
</table>

T2.3 / T2.4

T2.3
International Security Standards

Security Standards

- Technical Standards
  - ISO/IEC 11889 Trusted Computing Module (TPM)

- Application Standards
  - ISO/IEC 62443 Industrial Communication Networks

- Certification Standards
  - ISO/IEC 15408 Common Criteria Certification

- Management Standards
  - ISO/IEC 27001 Information Security Management Systems
Comparing hardware & software-based trust anchors

<table>
<thead>
<tr>
<th>Feature</th>
<th>Main CPU</th>
<th>SW</th>
<th>Main CPU</th>
<th>HW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crypto functionality</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td></td>
</tr>
<tr>
<td>Strong isolation</td>
<td>❌</td>
<td></td>
<td>✅</td>
<td></td>
</tr>
<tr>
<td>Security certification</td>
<td>❌</td>
<td></td>
<td>✅</td>
<td></td>
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<tr>
<td>Tamper proof</td>
<td>❌</td>
<td></td>
<td>✅</td>
<td></td>
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<tr>
<td>Manufacturer using security certified processes</td>
<td>❌</td>
<td></td>
<td>✅</td>
<td></td>
</tr>
<tr>
<td>Personalized security certified processes</td>
<td>❌</td>
<td></td>
<td>✅</td>
<td></td>
</tr>
</tbody>
</table>
Security processes determine security quality

- Threat and attack scenario analysis
- Security objectives and measurement

- Security-certified production
- Secured personalization

Security hardware & software architecture expertise

- Secured design and development environments

Portfolio of security certified trust anchors

- Security Lab for security penetration testing

The result of processes
Productive 4.0
Consortium at the kickoff
18 May 2017, Dresden
The participating countries are Austria, Belgium, Finland, France, Czech Republic, Denmark, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden and Turkey.

Thank you very much for your kind attention!

Thomas Gutt
Co-ordinator Productive4.0

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Productive 4.0

Productive 4.0 is a European co-funded innovation and lighthouse project on Digital Industry. The project receives grants from the European H2020 research and innovation programme, ECSEL Joint Undertaking, and National Funding Authorities from 19 involved countries under grant agreement no. GAP-737459 - 999978918.

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