

## CINI4.0 presentation for HEIn4.0 study visit– 03/05/2022

Converging Industrial Networks for Industry 4.0  
*New challenges for wired ethernet*

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## Outline

1. Project partners
2. Presentation of the project – Role of the User Committee
3. Project agenda for the upcoming months
4. Smart Factory OWL – R&D support for the local industry

## Project Partners

- **Project Partners:**

- KU Leuven, Technologiecampus Gent (coordinating association)
- UGent, campus Kortrijk
- TH-OWL / inIT (Lemgo)
- Fraunhofer IOSB-INA (Lemgo)
- FE ZVEI

- **Funding organizations:**

- AiF (Germany)
- Vlaio (Flanders)

3



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## User Committee members

- **German members:**

- Endress+Hauser SE+Co. KG (Maulburg)
- Hilscher Gesellschaft für Systemautomation GmbH (Hattersheim am Main)
- Indu-Sol GmbH (Schmölin)
- Perinet GmbH (Berlin)
- rt-solutions.de GmbH (Köln)
- ZVEI e.V. (Frankfurt am Main)
- R. STAHL Schaltgeräte GmbH (Waldenburg)
- TOSIBOX GmbH (Lemgo)
- ESR Pollmeier GmbH Servo-Antriebstechnik (Ober-Ramstadt)
- InnoRoute GmbH (München)
- Lenze SE (Aerzen)

4



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## User Committee members

- **Belgian members:**

- Phoenix Contact NV/SA (Zaventem)
- Prokorment VOF (Delft, The Netherlands)
- Bintz NV/SA (Zaventem)
- Prolink Engineering BV (Deinze)
- ArcelorMittal Belgium NV/SA (Zelzate/Gent)
- DSP Valley vzw (Leuven)
- Linkworx BVBA (Aalter)
- Volvo Cars Gent (Oostakker/Gent)
- iBA Benelux BVBA (Gent)
- VMA NV/SA (Sint-Martens-Latem)
- Agoria vzw (Brussel)
- Siemens NV/SA (Huizingen)

5



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6



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## Presentation of the project – Role of the User Group

### CINI4.0: Converging Industrial Networks for Industry 4.0

#### *New challenges for wired ethernet*

**Main goal:** The main goal of the CINI4.0 project is to thoroughly investigate the applicability of technologies such as:

- OPC UA (Open Platform Communication Unified Architecture),
- Time Sensitive Networking (TSN),
- Single Pair Ethernet (SPE)

for industrial applications with the focus on seamless integration in both greenfield and brownfield installations.

There is still a (huge) lack of understanding the potentials and performance limits – also while combining these technologies – and little or no experience in implementing them. The (upcoming) convergence of IT and OT networks may emphasize the need for understanding these technologies even more.

7



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## Presentation of the project – Role of the User Group

### Some topics which are part of CINI4.0:

- The technology OPC UA is quite widespread, however, but however typically implemented in relatively simple applications of data collection, not using the full power of its information modelling. Due to the fact that several working groups are dealing with this technology as a basis for concepts such a digital twin, there is still a need to investigate this technology more accurately in an heterogenous industrial environment to check performance of different available implementations, scalability, interoperability, etc.
- Investigate new design methods for performant Ethernet networks and network structures, based on both classic 100 Mbps ethernet/PROFINET and on SPE and TSN. This includes implementation of more robust networks and automation systems; think of EMI, (built-in) redundancy and security, etc.
- Designing and testing migration paths (and even co-existence) for existing brownfield machines and plants are an inherent part of the project.

8



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## Presentation of the project – Role of the User Group

### Planned outputs from CINI4.0:

- Best practices, guidelines, scientific publications, ... that provide an objective study of the potential of these technologies for industrially relevant use-cases.
- Measuring technologies, technology demonstrators and larger industrially relevant use-cases.
- The project puts one of its accents on lifelong learning by means of workshops, hands-on courses, and conferences aimed at industry.

### General KPIs of the project:

- KPI 1 – Companies (users) reached, 77 in total show a lot of interest. (Outreach)
- KPI 2 – Validation using large lab set-ups or industrial use cases, 4 in total. (Innovativeness)
- KPI 3 – Number of FTE days of high-end training for industry people: 325. (Knowledge transfer, outreach)
- KPI 4 – Scientific papers (4), seminar on scientific conference (1), stand on (external) fairs (1), own fairs & study days (5), articles in dedicated press (6), etc. (Outreach, knowledge transfer, dissemination)

9



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## Presentation of the project – Role of the User Group

### Organization in workpackages - Timing:

WP1 – Literature study (Aug 21 – Oct 21)

WP2 – Measuring concepts and experimental quantification on component level: PHY & DLL (Aug 21 – Oct 22)

- Design of measuring methods / Experimental quantification of operational properties / Verification of robustness at component level / Intensive technical exchange days

WP3 – From data to information: OPC UA as middleware (Aug 21 – Oct 22)

- Operational aspects of OPC UA and information modelling / Assessment of the built-in security aspects of PN/TSN/OPC UA

WP4 – Experimental quantification at system level (Apr 22 – Apr 23)

- Integration of components into systems / Measuring operational properties / Designing for robustness at system level / Intensive technical exchange days

WP5 – Validation using large lab setups or industrial use cases (Apr 22 – May 23)

- Validation of design methods on industrial grade use cases / Migration and implementation aspects in brownfield installations

WP6 – Knowledge transfer (Aug 21 – Jul 23)

- Website design / Promotional activities / Technology radar / Hands-on training and workshops + Conferences/fairs/seminars / Closing event

WP7 – Project management

10



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## Presentation of the project – Role of the User Group

### Project duration

- 01/08/2021 to 31/07/2023 – 24 months

### Project Budget

- Overall budget ≈ 825 k€
- 445 k€ in Flanders
  - 92.5% funded by CORNET/Vlaio
  - 7.5 % co-funding by companies in the Flemish User Group
  - 291 k€ KU Leuven, 154 k€ UGent
- 381 k€ in Germany
  - 100 % funded by CORNET/AiF
  - 201 k€ TH OWL, 180 k€ Fraunhofer IOSB-INA
- Mainly staff cost, no large equipment in the project

## Presentation of the project – Role of the User Committee

- Practical input from the UC:
  - Use cases + requirements
  - Challenges from the industry perspective
  - Equipment for testing and demonstration
- Every 3 to 4 months, a User Committee is planned, alternately in Flanders and Germany, with the possibility to join online.
- An overview of the project status will be given, and each time we will discuss a number of technical items/results.
- Problems and challenges can be discussed and – keeping the project application in mind – the next steps are discussed.
- Detailed feedback/review, mutual transfer of knowledge.
- Participate to the short online survey (planned in 2-3 weeks from now)

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13



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## Project agenda for the upcoming months

- **Items for project partners only**
  - Technical exchange “weeks”
    - 4<sup>th</sup> one: week of June 20.
- **For the targeted audience:**
  - Indumation fair: 16-18/05/2022, joint CINI4.0 stand of UGent and KU Leuven
  - Hannover Messe: end of May, early June 2022, promotion and presentation of equipment and set-ups + study visit / contacts
  - CINI4.0 Conference Day: 16/06/2022, 2 parallel tracks of technical lectures, stands (free for UG members); access is free for attendants
  - CIIT-TechTalk: in Lemgo/Online, on technology and innovation
  - OPC UA plug fest: SmartFactoryOWL, Fall 2022, including technical stand of Flemish partners
  - 1<sup>st</sup> date to be scheduled: 5 day hands-on course for practicing engineers in industry

14



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## Smart Factory OWL

- **Short presentation of the project partners:**
  - ZVEI
  - **TH-OWL / inIT**
  - **Fraunhofer IOSB-INA**
  - UGent
  - KU Leuven



TH-OWL / Institute Industrial IT - inIT

Dr.-Ing. Lukasz Wisniewski

CIN4.0 | Lemgo/Cyberspace | Dr.-Ing. Lukasz Wisniewski | 16.09.2021

# Ostwestfalen Lippe (OWL) Region



(Auswahl)



The Technology-Network  
Intelligent Technical Systems OstWestfalenLippe, Germany

**it's owl**

Start: January 2012  
174 Partners  
45 projects  
budget > 100 million€

It's owl successor  
Start: December 2018  
budget > 100 million€

# Innovation Campus Lemgo



Centrum Industrial IT (CIIT)



Fraunhofer-Gesellschaft



SmartFactoryOWL



22.03.21 Food Factory 4.0



Innovation Spin



Start-Up Center

## LEMGO: TECHNOLOGY & KNOWLEDGE TRANSFER AT ITS BEST

World-class infrastructures on „Innovation Campus Lemgo“



**CIIT** SCIENCE-TO-BUSINESS CENTER  
CENTRUM INDUSTRIAL IT „WHERE IT MEETS AUTOMATION“

**inTT** | TH OWL

- Industrial Communications
- Security
- Digital Twin
- Artificial Intelligence in Automation
- User Experience and Interaction Design

**Fraunhofer**  
IOSB-INA

- Industrial Internet
- Intelligent Automation
- Usability Engineering
- Cyber Security

CIIT II                      CIIT I

# Smart Factory OWL



## inTT – institute industrial IT

- Established in 2007
- 7 Professors
- 60 Researchers
- Excellent in education and further education
- Applied sciences research
- Over 3,0 Mio. Euro external fund in year



23

## Working Group Computer Networks

- Industrial Communication
  - Challenges:
    - Real-time
    - Robustness
    - Reliability
    - Interoperability
    - Management
- Competence areas
  - Industrial Ethernet
  - Industrial Wireless
  - IT-Security



24

## Technical Infrastructure

### Smart Warehouse

- Technical infrastructure for digital twins
- Demonstrates the interoperability of various components and protocols including OPC UA
- OPC UA and digital Twin enable access to digital descriptions and submodels of machines, products and operating equipment



25

## Technical Infrastructure

### CDMA OPC UA Demonstrator

- Digital representation of a real modular assembly machine;
- Enabled by using OPC UA and digital twin
- Almost every component is an OPC UA node
- Visualizes information technology operations

<https://digitaltwin-vdma.org>



26

## Technical Infrastructure

### Agile production system

- Complete production process from raw material to packaging
- Each production step realised by an individual module
- Each module has an OPC UA Server for condition monitoring



27

## Smart Factory OWL



- **From WFCS 2022 conference, April 2022: SFOWL tour movies**
  - Cyber security: 4:11
  - **Digital twin: 14:24**
  - 5G: 12:15
  - **TSN: 4:46**
  - **Real production in Smart factory: 14:06**



[www.cini40.eu](http://www.cini40.eu)



29

