PONSSE EPEC FORWARD’27 ECOSYSTEM WEBINAR

21.2.2025

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FORWARD’27 ECOSYSTEM WEBINAR
Quidelines

- Kindly keep your microphones muted
- The webinar will be recorded
- Q&A will be at the end

- Welcome to Ponsse Epec FORWARD’27 webinar!

FORWARD'27 ECOSYSTEM WEBINAR

13:00 Welcome and webinar quidelines, Agenda

Co-Innovation -projects:

13:05 FOSSA II: *Jukka Kömi*, Professor, University of Oulu
Commentator: *Kalle Einola*, Director, Research & Programs, Ponsse R&D

13:20 TwinFlow: *Jari Juhanko*, Staff Scientist, Aalto University
Commentator: *Jari Roivainen*, Process Owner, Measurements and New Products, Ponsse Operations

13:35 Aurora: *Jukka Yrjänäinen*, Project Manager, Tampere University
Commentator: *Mikko Haapalainen*, Director, Control Systems, Ponsse R&D / *Kalle Einola*

13:50 Q&A

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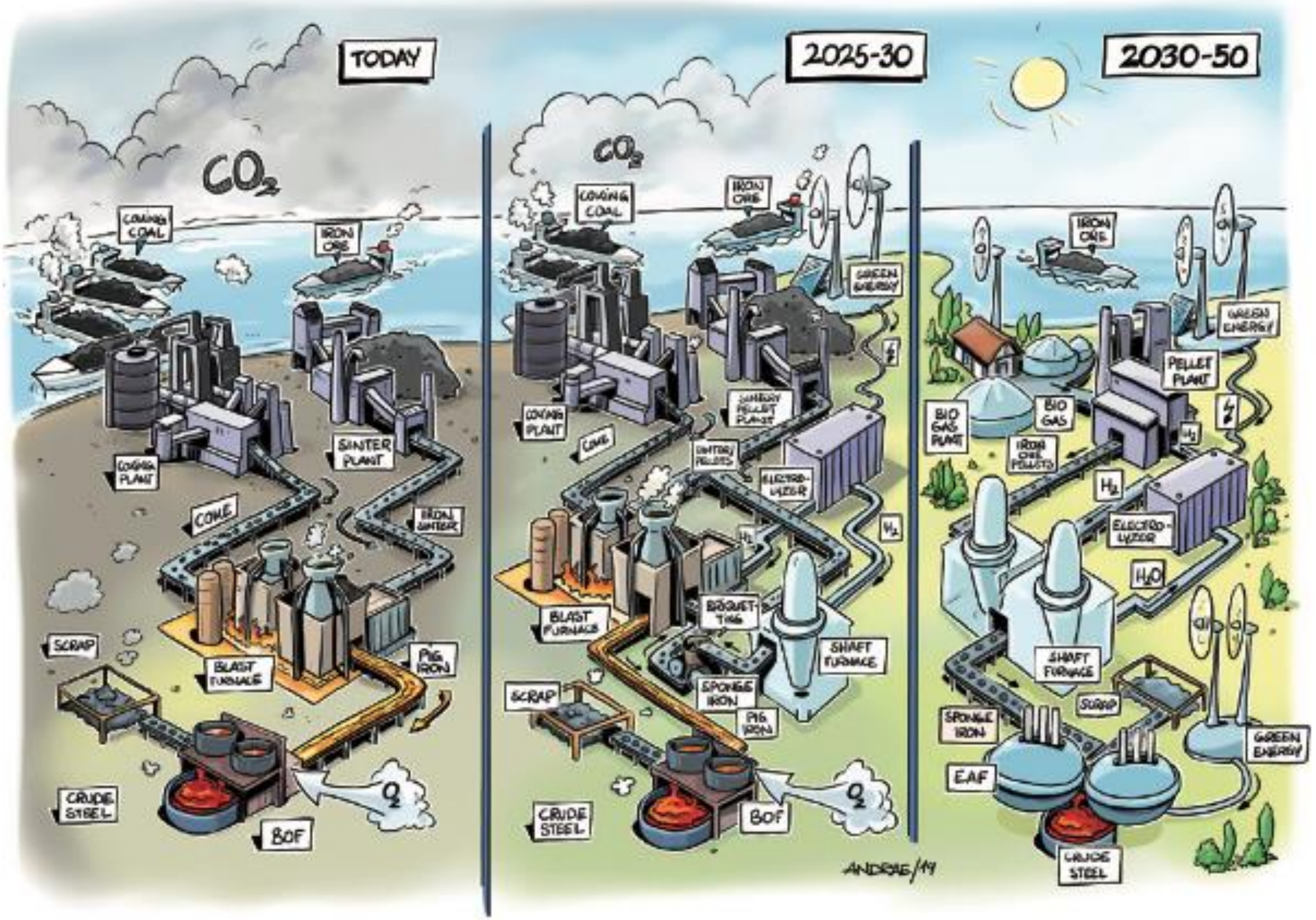
PONSSE EPEC FORWARD’27 EKOSYSTEEMIWEBINAARI

FOSSAII

Future Steelmaking, Steels and Steel Applications

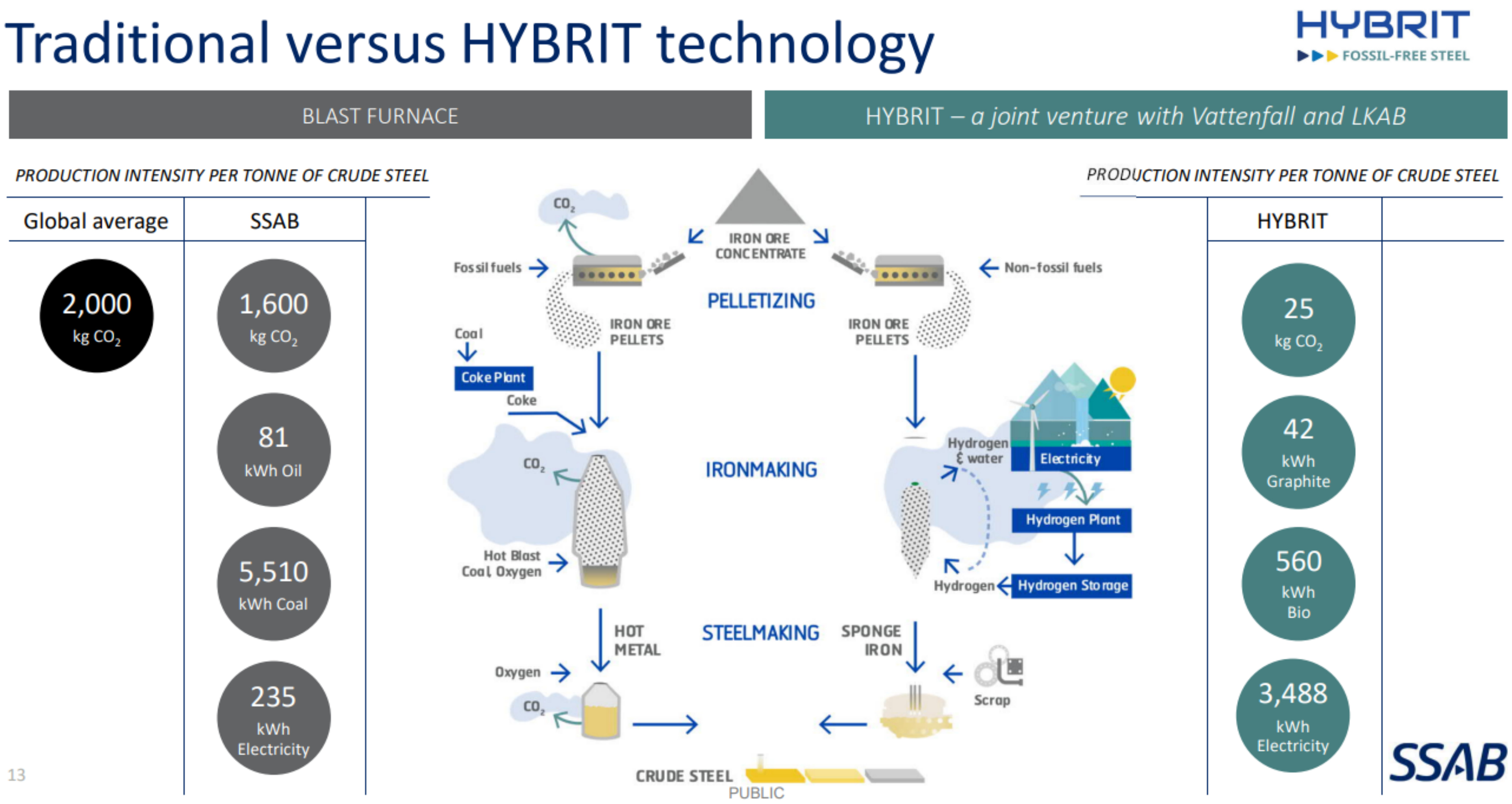


Finnish **metals (steel) industry** is committed to reduce greenhouse gas emissions by 70 % from the level of 2008.

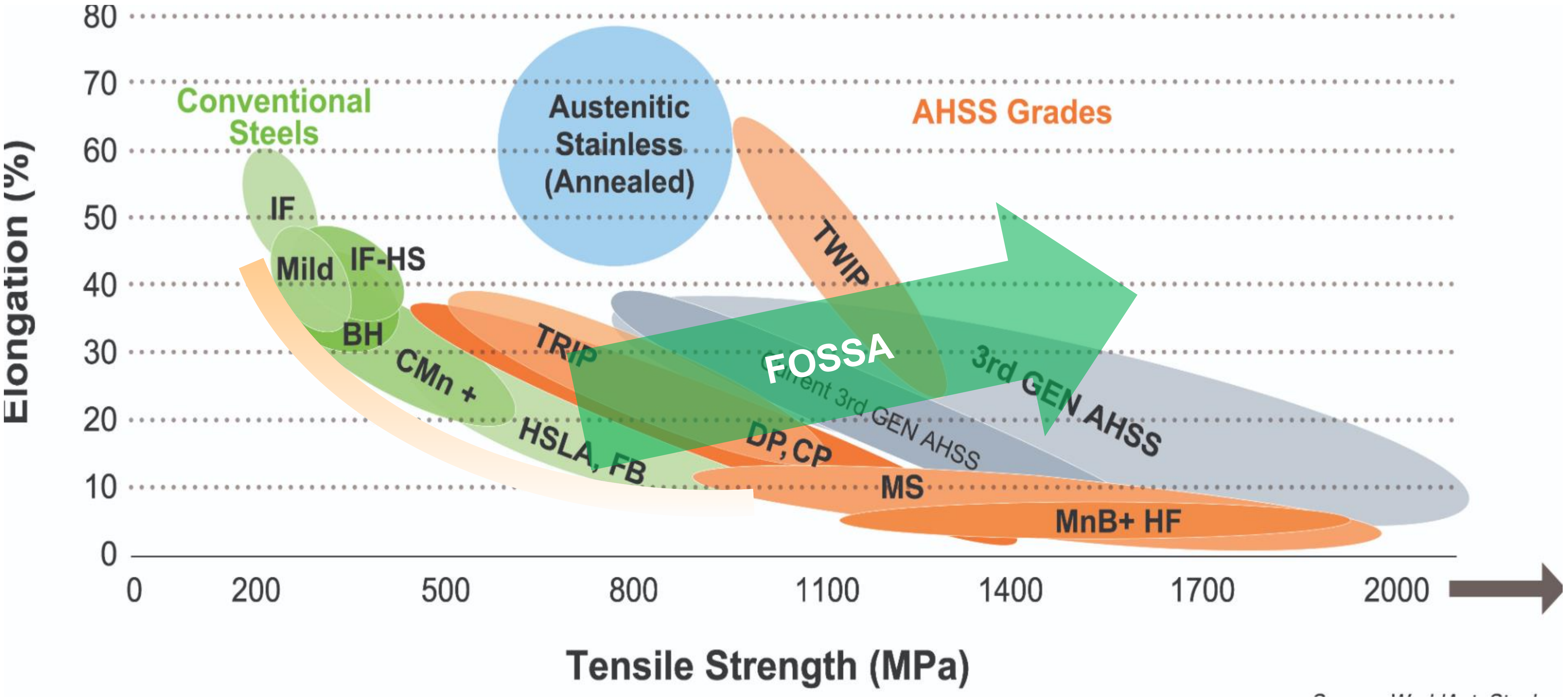
In addition, it is estimated that the use of **ultrahigh-strength steels** in vehicles will decrease greenhouse gas emissions by at least the same amount.

So, even 15 % reduction in Finland's CO_2 emissions is possible, with enormous potential on a global scale.

Lähtökohta: Fossiivapaa terästuonto



Teräskehitys UHSS/AHSS teräslajit



FOSSA, FFS & TOCANEM – Impact and focus areas

Steels' life cycle – affects even 60% of world's GDP

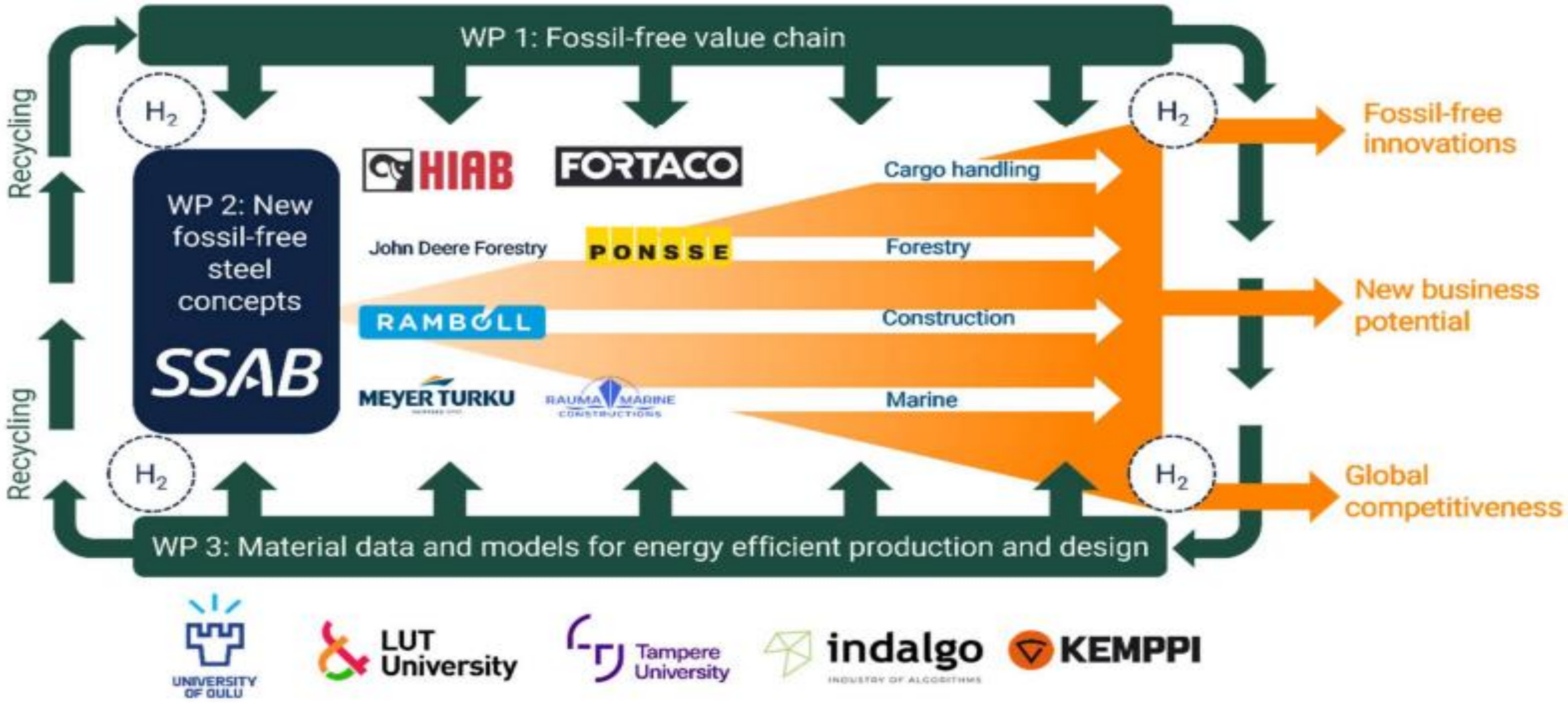
Today: *Steelmaking 2 kg CO_2 / 1 kg steel (7-8 % of total emissions)*
- Ironmaking 70 %
- Steelmaking 20 %
- Upgrading 10 %
- Zero-Waste Mill: **FFS II, TOCANEM & FOSSA II**
- **Enable -6 % of total CO_2 emission**

Today: *1-2 % of total emissions*
FOSSA II: UHSS for novel applications
→ enable -10 % of CO_2 emission

Today: *90 % of total emissions*
FOSSA II:
- UHSS for novel applications

→ enable -6 % of total CO_2 emission

FOSSA konsortio



FOSSA some results

SSAB Zero™
A fossil carbon emission-free steel based on recycled steel, produced using fossil-free electricity and biogas. The first commercial steel of its kind – launched in 2023.

0.0 kg CO_2e emissions per kg steel
The fossil carbon emissions in operations including purchased energy (scope 1-2 and transportation between SSAB sites)

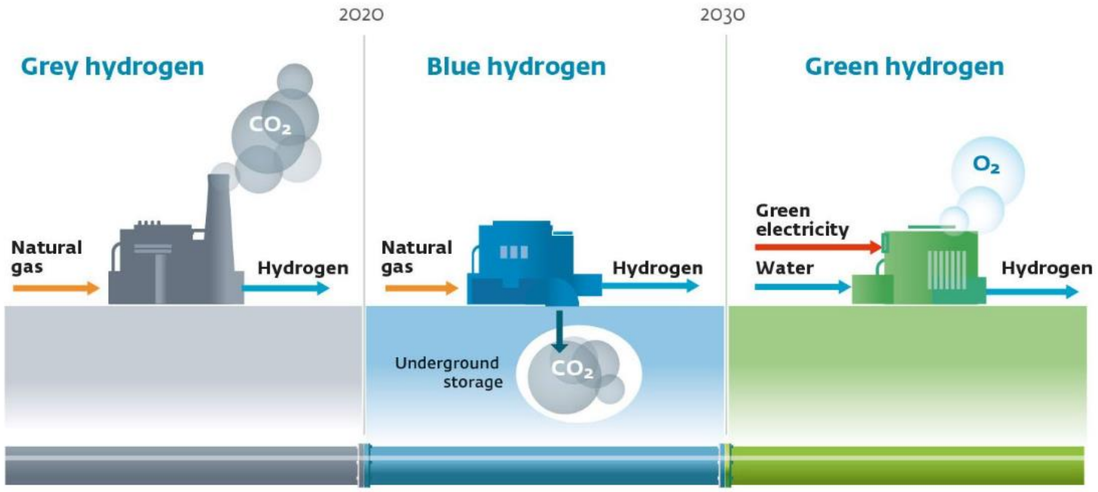
Figure 2: SSAB Zero 0.0kg CO2 emission per kg steel (a)

Figure 3: Multilift Ultima 18S FFS in IAA exhibition

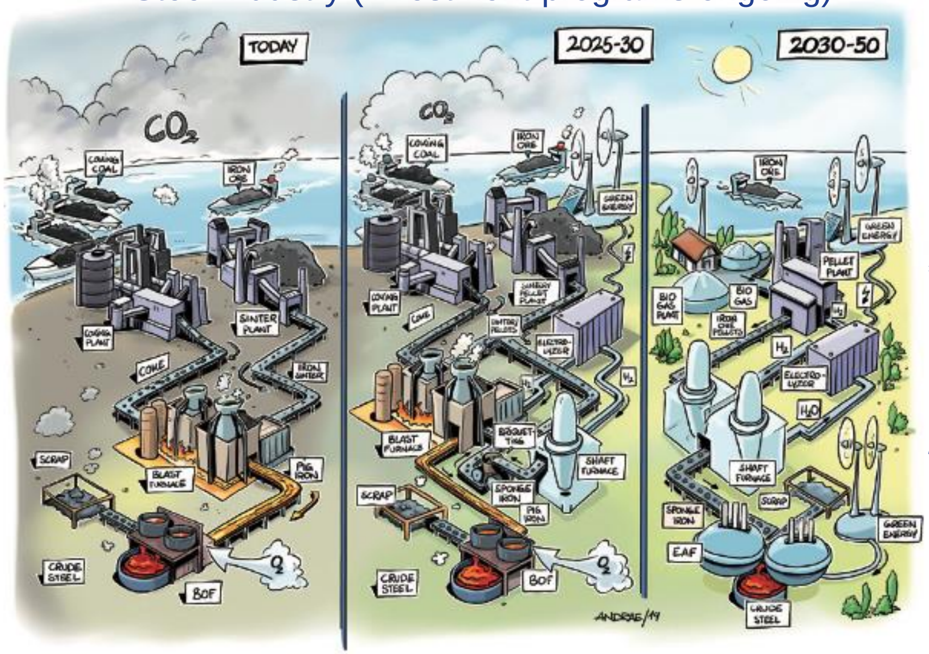
From Sustainable Thinking to Fossil-free Business

"The world we have created is a product of our thinking. If we want to change the world, we must change our thinking", Albert Einstein

Energy industry (investment programs ongoing)
→ *increases the price of energy*



Steel industry (investment programs ongoing)

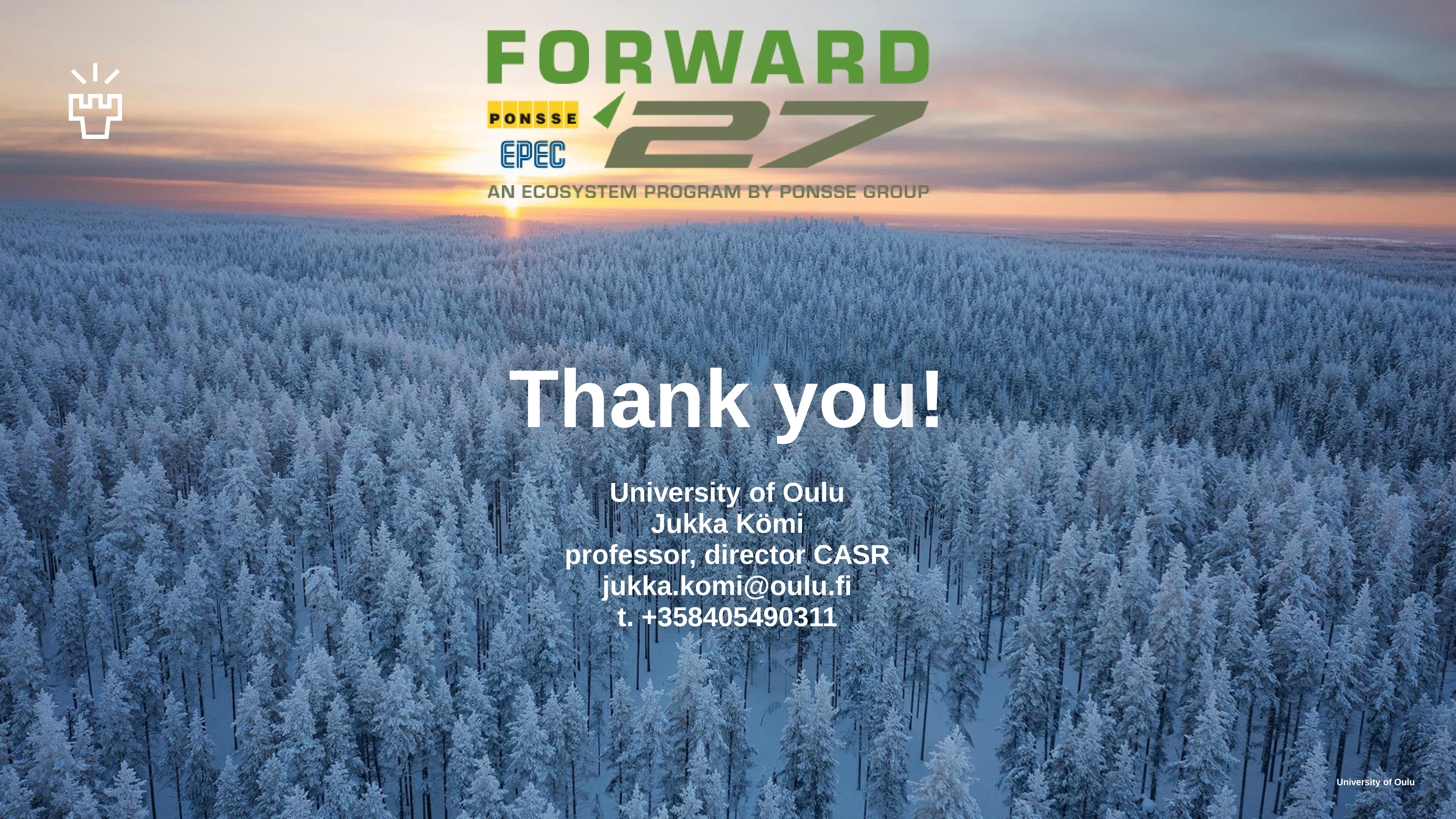


EU's carbon goal will cost steelmaker up to €40bn (with 136 Mtn steel production)

→ *increases the production costs*

Manufacturing → *increases the price of production*
Use and reuse → *increases the costs*
100 % **recycling** → *increases the costs*

So, this will become a profitable business, and we are part of it



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Thank you!

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TwinFlow

Merging Information Technologies (IT) and Operational Technologies (OT) for enhanced production-intralogistics

Ponsse Epec FORWARD'27
ekosysteemiwebinaari 21.2.2025

Jari Juhanko, D.Sc, Project Coordinator

Aalto University

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TwinFlow

Facts & Figures

- 3 years (2024-2026)
- 10 companies
- 2 universities, 9 research teams
- Budget 9,3 M€ (universities 3,9 M€)
- Funded by BF Data Economy Program

Part of Konecranes' and Ponsse's Veturi programs

Zero4 FORWARD '27

Data driven operations

Business case

Legal framework

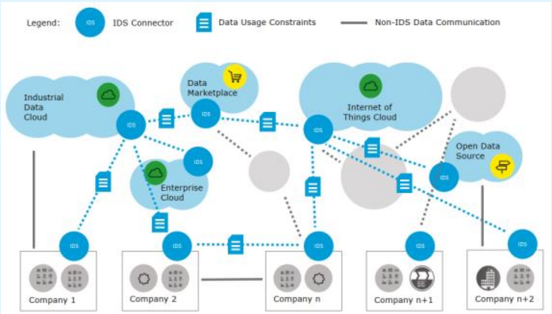
Enabling technology

People (Social sustainability)

TwinFlow Concept

European IDS Reference Architecture Model

- Data ecosystem – data space with specific partner roles
- Common standards and rules for data sharing
- Data sovereignty
- Governance model and rulebook
- Enables added value for partners

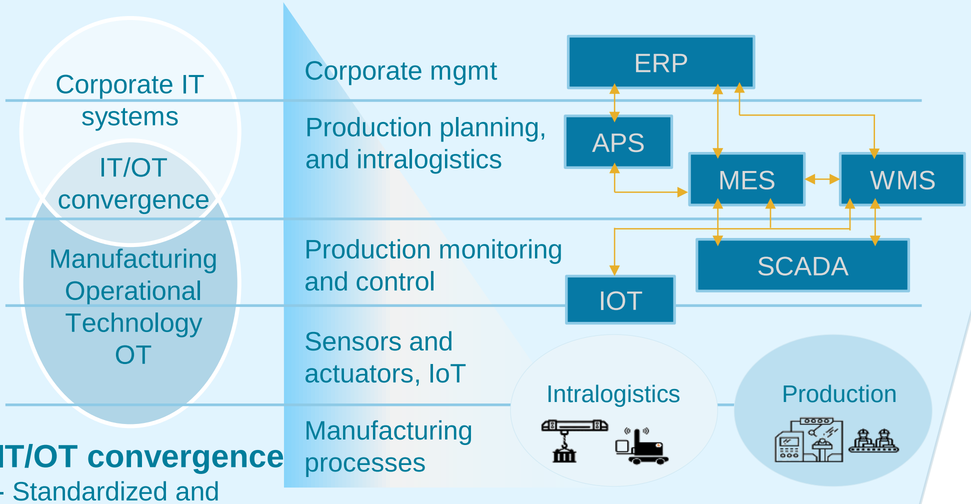


IDS Reference architecture model

IoT-Edge-Cloud continuum:

- Federated and distributed data and compute architecture enables advanced timely analytic services and applications

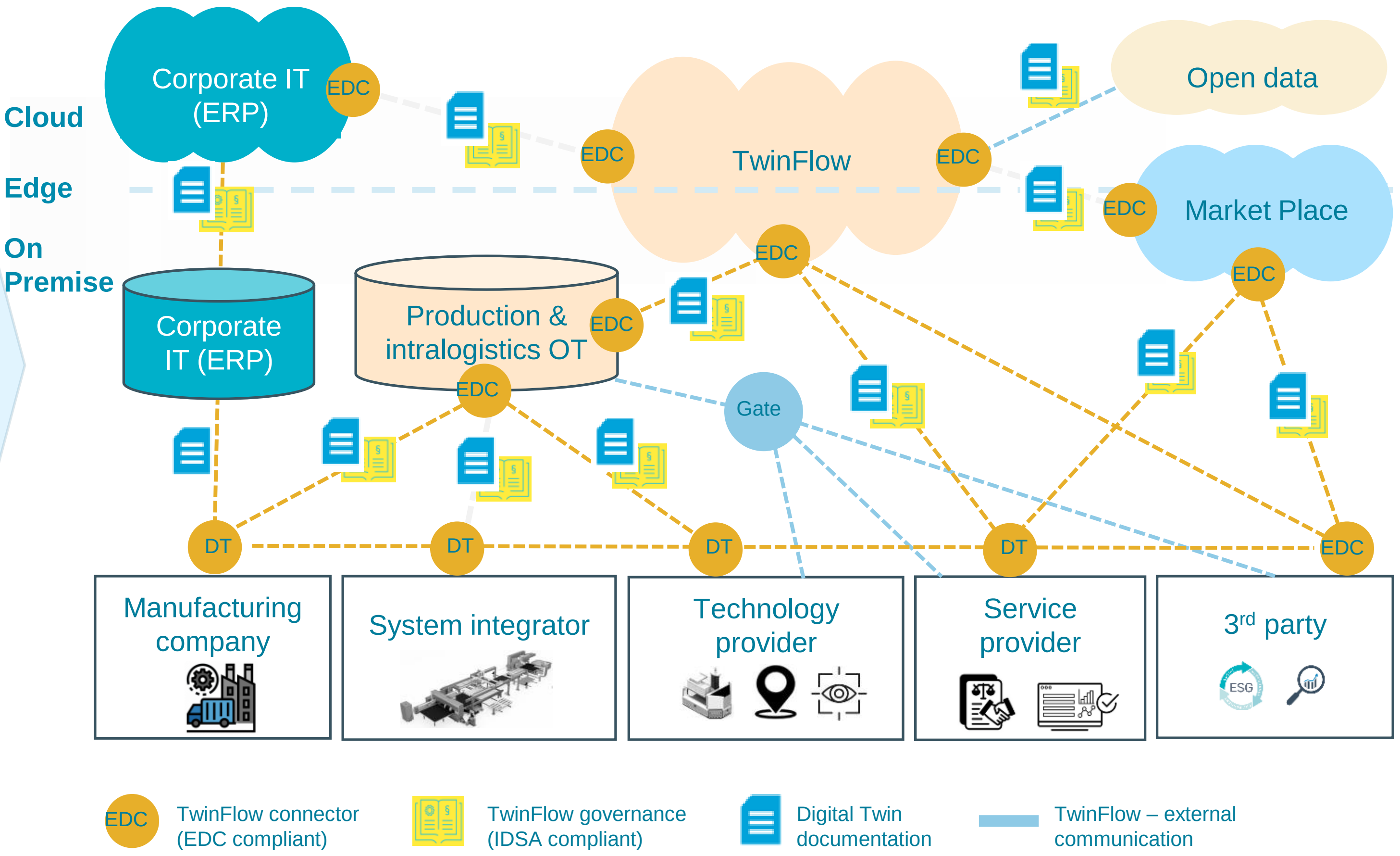
Industrial automation



IT/OT convergence

- Standardized and scalable integration of corporate IT and manufacturing Operations Technologies OT

ISA-95: relation and responsibilities between enterprise systems, production operational systems and automation:



TwinFlow Partners and Roles

Ecosystem facilitation

KONECRANES Lifting Businesses™
Ecosystem orchestration, **industrial PoCs**. New business opportunities

A" Aalto-yliopisto
Testbeds: Industrial Internet Campu AIIC & Factory of Future

Tampere University
Federated architecture over Edge-Cloud Continuum, distributed data

Production-Intralogistics integrator

Prima Power
Industrial PoC: Manufacturing asset interoperability and compatibility for enhanced material flow

8760 Fastems
Industrial PoC: Enhanced interoperability, situation awareness and advanced manufacturing operations management

VASKI
Industrial PoC: Data compatibility in manufacturing ecosystems

Production-Intralogistics implementation

PONSSE
Industrial PoC and testbed merging production, intralogistics and IT

Logisnext
Logistics solution provider: testbeds for **industrial PoCs**.

Technology and service partners

NOCCELA
UWB positioning based added value offering enhancing manufacturing operations mgmt

IO LAKES
Data ecosystems, data governance & rule books: data architecture, business and legal.

VAISTO
Machine vision & advanced analytics in asset tracking for enhanced situational awareness

EVIDEN
Integration of engineering, manufacturing and intraplant logistics

TwinFlow

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TwinFlow Research Teams

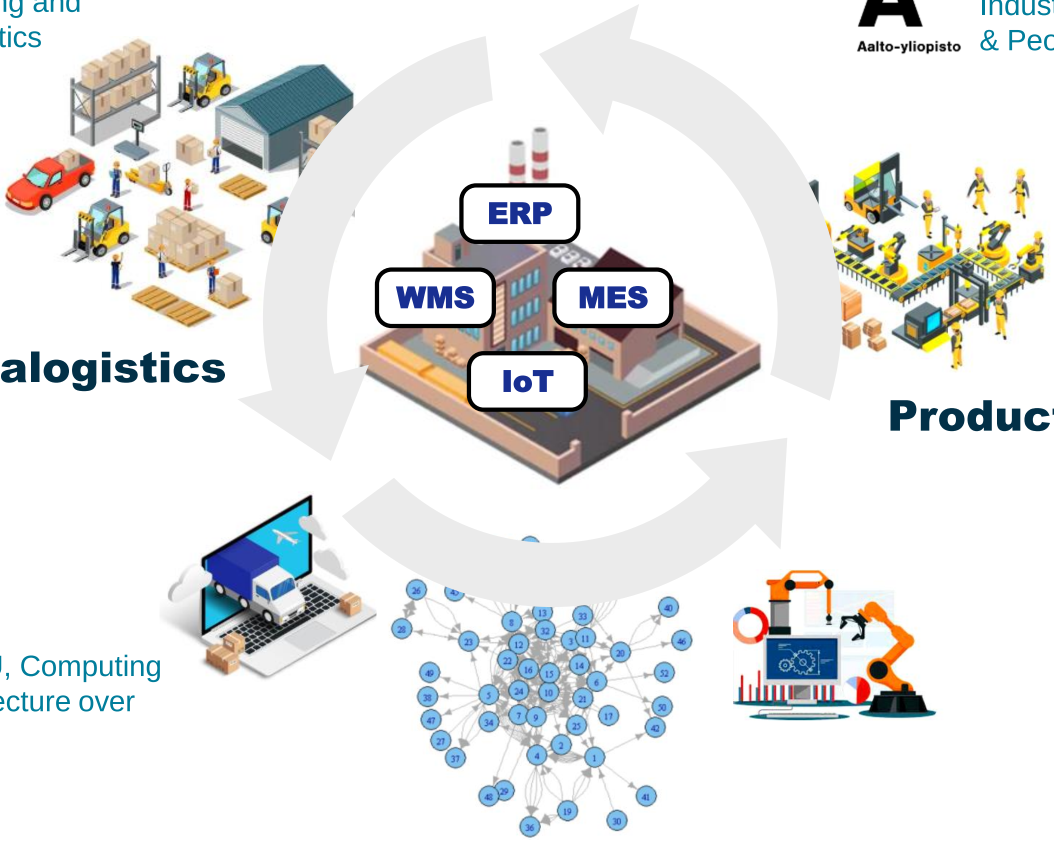
Aalto-yliopisto — Risto Ojala: ENG Autonomous Systems; Tracking & Tracing, Machine Vision & Identification

Aalto-yliopisto — Prof Kari Tanskanen: SCI, Industrial Engineering and Management, Logistics

Aalto-yliopisto — Jari Juhanko: TwinFlow PI: Mechatronics, Industrial Internet: Technology, Business, Legal & People

Aalto-yliopisto — Ilkka Lakaniemi: BIZ, Fair Data Economy, Data Sharing Ecosystems

Aalto-yliopisto — Prof. Esko Niemi: ENG Production Engineering; Production Planning & Control,



Aalto-yliopisto — Udayanto Atmoyo: ELEC, Industrial Automation, Cyber Physical Systems

Aalto-yliopisto — Riku Ala-Laurinaho: ENG Digital Industry, Semantic Digital Twins, Ontologies

Tampere University — Prof. David Hästbacka: TAU, Computing Sciences; Federated Architecture over Edge-Cloud Continuum

Aalto-yliopisto — Prof. Marko Turpeinen: SCI Computer Science: Data Sharing & Governance, IT&OT Interoperability

Research Goals

- We propose **standard architecture model**, common ontology and standards-compatible IT/OT integration platform for advanced analytics across management systems.
- We **integrate heterogenous data** from IT/OT systems, added with identification, tracking, tracing, indoor positioning and machine vision systems for enhanced **situational awareness.**
- We build **demonstrators and showcases** together with industry, technology providers and service partners

Impact

- **Improved LEAN and OEE metrics**: Situation awareness enables factory level optimization and better decision making
- **New data driven business**: *Standard architecture model* and *legal framework* enable strategic partnerships – production-intralogistics operations as a service
- **Scalability**: Standard way of sharing data can be extended to upstream and downstream in the supply chain. Similarly, quality, maintenance, sustainability and energy could benefit from shared information and situational awareness

TwinFlow

TwinFlow:

Filling in a few of 1000 piece digitalization puzzle

Tampere University

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Aurora Co-innovation

Forward’27 Webinar

21.2.2022

Project Manager Jukka Yrjänäinen et al, Tampere University

Aurora: Automated and Connected Machines

Project focuses on combining advanced

Wireless technologies and **Robotics** with AI research in the

application field of

Heavy Working Machines

(Forest machines, Excavators, Street sweepers, Trucks, Forklifts, Mining Machines … etc.)

Consortium Partners

Research

- Robotics Automation
- Wireless Technologies
- Robot learning

Tampere University

Aalto University

Machine Manufactures

- Forest Machines
- Sweepers
- Mobillity solutions

PONSSE

SLEIPNER

TROMBIA

Wireless Technology and solutions providers

- Communication HW
- Communication SW
- Localization solutions

SATEL

ublox

Wirepas

Aurora public consortium in brief

Tampere University

- Robotics: Professor Reza Ghabcheloo (PI)
- Wireless: Professor Mikko Valkama

Aalto University

- Robot Learning: Professor Joni Pajarinen

Budget for the public research ~2 M€

Schedule Jan 2025 – Oct 2026

- Likely to be extended to spring 2027

Industry:

Ponsse (Veturi)
Sleipner
Trombia
Satel
Wirepas
u-blox

Tampere University

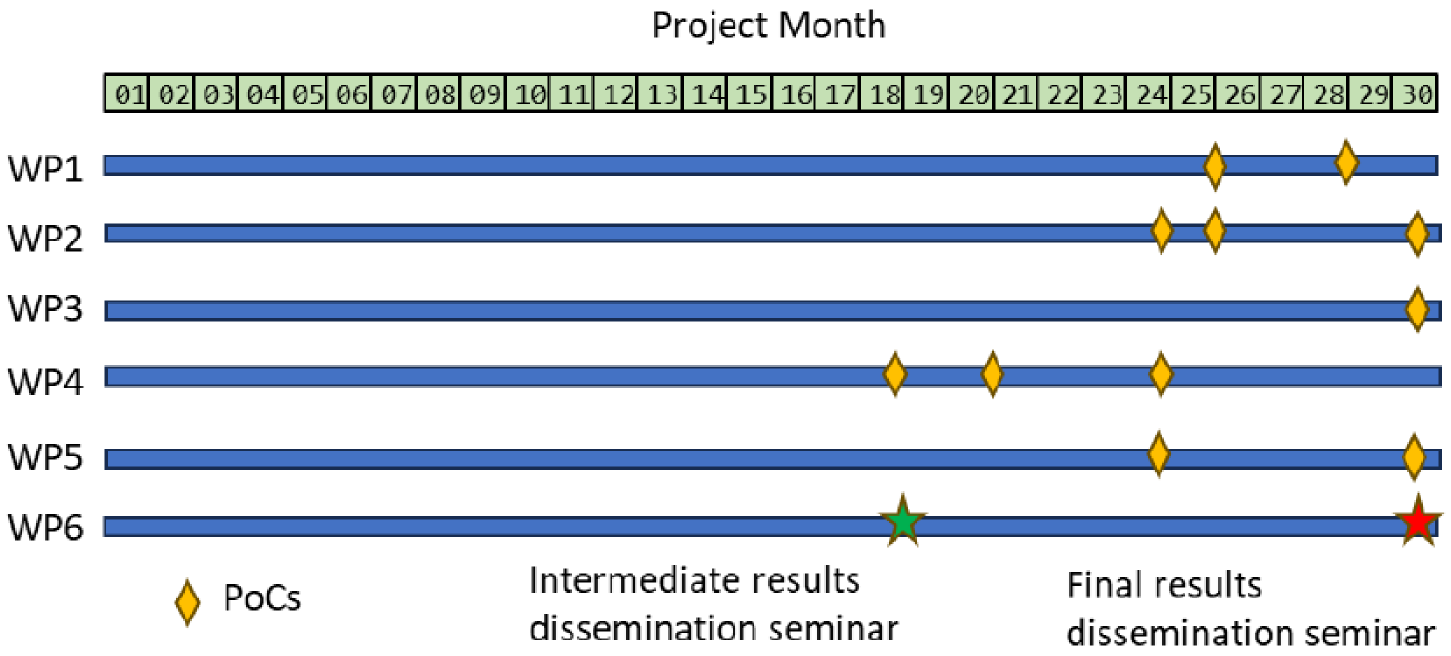
Project Schedule

Research project has started in the beginning of this year.

Company projects have been started earlier 24.5.2024.

Planned end of the project is Oct 2026, but due to delays in funding decision it is likely that project will be extended to spiring 2027.

- Five technical Work Packages that produce different PoCs
- Two Larger seminars to disseminate the results.



Project results dissemination

Projects aims to create Proof-of-Concepts to demonstrate technology and research results.

Public, open for industry, results dissemination seminars will be arranged.

Results will be disseminated in the form of scientific publications, research reports and thesis works.

Tampere University

Work Packages

WP1: Multi technology radio communication

- Multiple state of the art connectivity technologies enabling **communication inside** and **between the machines**, and **machine to the cloud**.
- This WP focuses on the research of **highly scalable and reliable low-latency radio** access solutions for intelligent machines.

WP2: Robust state estimation and distributed control over wireless network

- **Robust algorithms for state estimation** based on information received over wireless network (e.g. IMUs, encoders) and local information (e.g. motion models).
- State estimation uncertainty and reliability is also calculated. Predicted uncertainty measures are used to optimize communication for energy consumption.

WP3: Advanced learning for high performance and fault tolerant control

- Investigation of data **driven techniques to learn machine motion models** and develop **reinforcement learning based controllers for machine control** for the desired objectives, such as high-performance path following.
- State uncertainty estimates provided by WP2 are used to robustly and safely control the machine to maintain a guaranteed certain control objectives such as path following error bounds.

WP4: Radio based ranging, positioning, and sensing.

- Research target is **radio-based and radio + other sensors -based situational awareness** for future intelligent machines with focus on the challenging **6DoF tracking in real-time**, as well as sensing and mapping of the machine environment.
- Object detection using **4D MIMO Radar** to measure relative pose of different part of machine or that of between the machine and other objects in the line of sight

WP5: Shared human-machine control

- We research how a **human can safely and smoothly control machine with limited or challenging wireless connectivity**. We will study how operator joy-stick commands (Boom control case) or commands through visual interfaces (Driving control case) can be used to define the control objectives and modify the behaviour of the local autonomous/safety controllers running on the edge.

Example PoCs, but not limited to these ...

Fault tolerant control of the machine (driving or manipulation) based on wirelessly transmitted sensor data.

Boom state (position, velocity) estimation based on combining RF measurements and other sensor data.

Remote shared control (teleoperation) over the wireless channel.

Thank You!

Q & A

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THANK YOU!

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