



Twin Transition for The Timber Industry

DT based AR supported maintenance and assembly operations architecture

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26.9.23 / Brussels: The Manufacturing Partnership Day

Project ID Card

“Secure 5G-Enabled Twin Transition for Europe's TIMBER Industry Sector”

Call: HORIZON-CL4-2021-TWIN-TRANSITION-01

Topic: HORIZON-CL4-2021-TWIN-TRANSITION-01-08

1 June 2022 – 31 May 2025

36 months

Currently M13

10M €

Coordinator: Taltech (EE)

Web: <https://www.5g-timber.eu/>

The Problem



It is expected that in the coming years, the implementation of 5G in the EU manufacturing sector will drive **€458.3 billion** in additional industry revenues and **€131.8 billion** in added GDP contributions.

The use of 5G technology along with other enabling technologies, such as edge-computing and AI, can bring up to **20% to 30% increase** in productivity.

However, 5G and smart manufacturing are currently more widely adopted in **verticals with high-volume, easily standardisable, low-margin business models** where cost-savings and productivity efficiency are necessary to achieving economies of scale. The use of 5G, edge-computing AI by **small and medium manufacturers** is rare due to costly technological risks and lack of best practices.

Main Objective

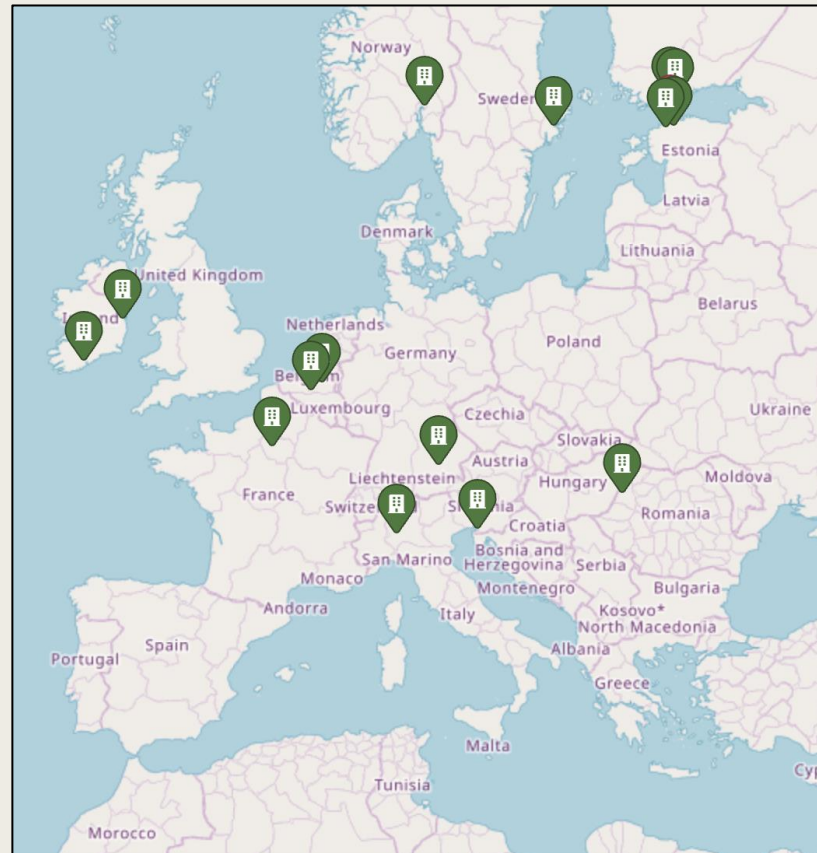


To support the **rapid uptake of 5G technologies**, considering real industrial practices and constraints in the **EU timber industry** over the whole value chain, focusing on **small-volume manufacturing industries**.

Consortium



16 organisations from 10 countries



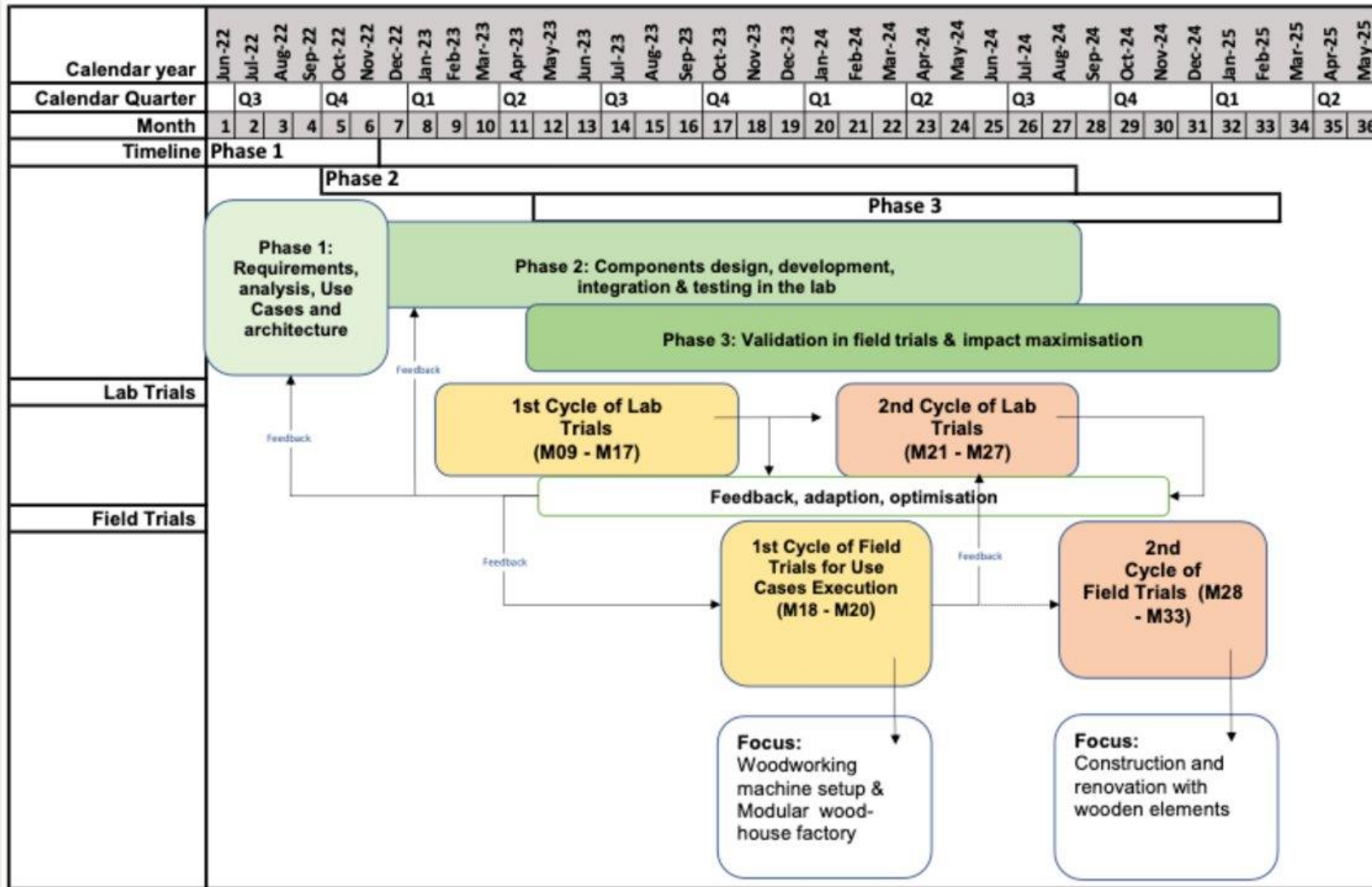
Consortium



16 organisations from 10 countries

No	Name	Abb.
1	TALLINNA TEHNIKAÜLIKOOL (COORDINATOR)	TALTECH
2	CROWDHELIX LIMITED	CHX
3	INLECOM COMMERCIAL PATHWAYS	INLE
4	JOTNE CONNECT AS	JOTNE
5	HARMET OU	HARMET
6	TEKNOLOGIAN TUTKIMUSKESKUS VTT OY	VTT
7	POLITECNICO DI MILANO	POLIMI
8	INNOVAWOOD ASBL	IW
9	HEKOTEK AS	HEKOTEK
10	TIETO FINLAND OY	TIETO
11	OCTAVIC PTS SRL	OCTAVIC
12	THALES DIS FRANCE SAS	THALES
13	TELIT CINTERION DEUTSCHLAND GMBH	TELIT
14	ACCELLERAN	ACC

Project Roadmap



The **Timber Helix** is an international open innovation community of specialists in the area of **wood and timber engineering, manufacturing, advanced production & process technologies, industry 4.0 and related disciplines**. It was launched to accelerate the twin transition by sharing innovative ideas and opportunities, improving commercial and scientific exploitation of projects results and partnering for new projects that could benefit the timber industries.



Timber

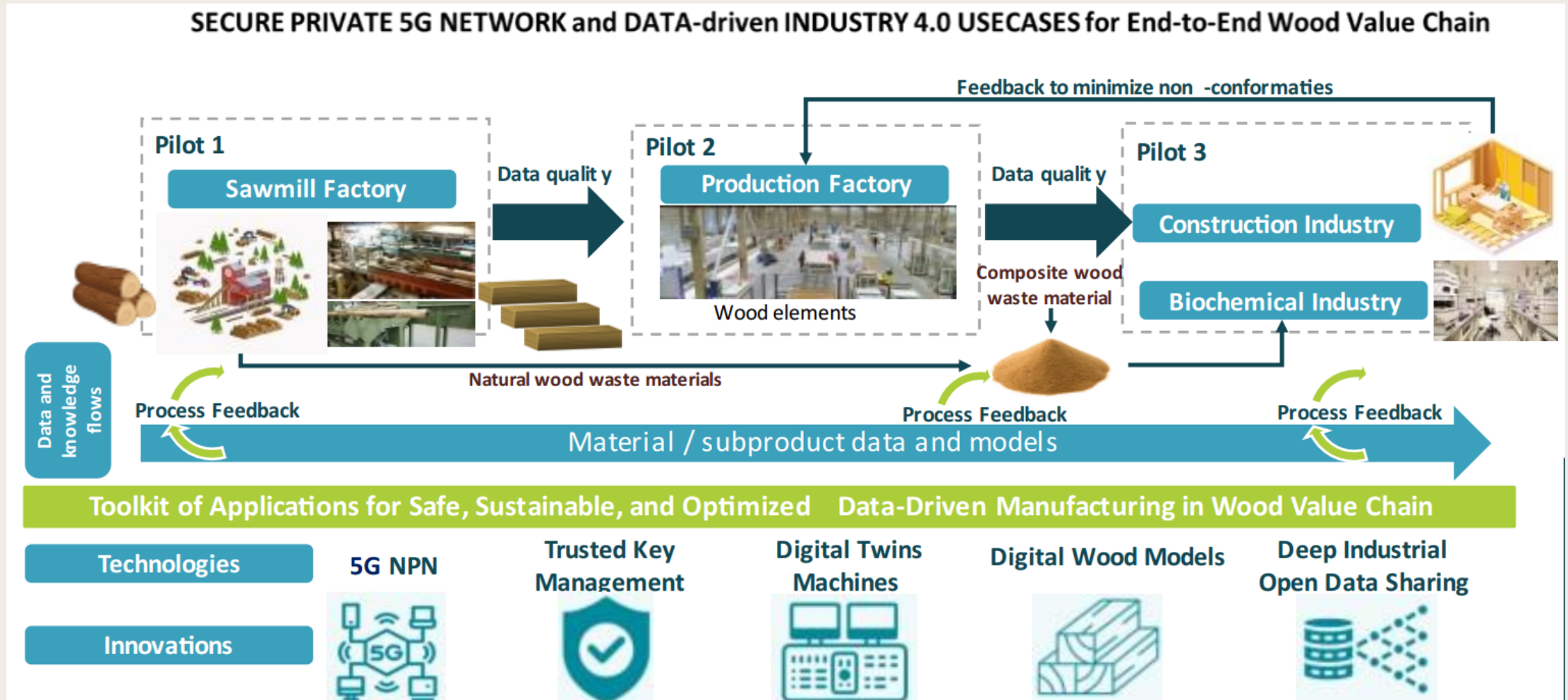
Wood value chain, manufacturing, advanced production & process technologies

Join us!



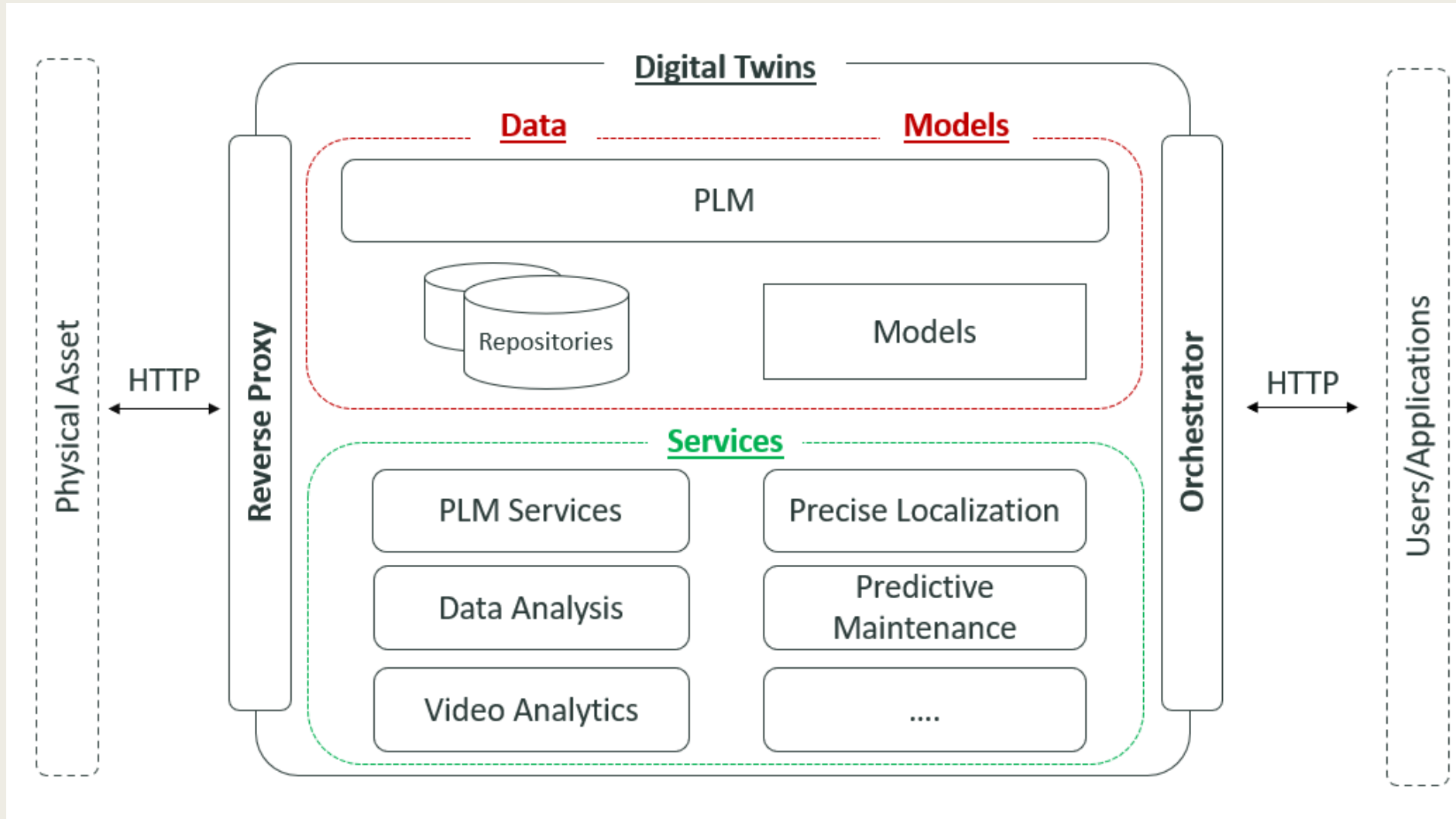
SCAN ME

Overview of Use Cases

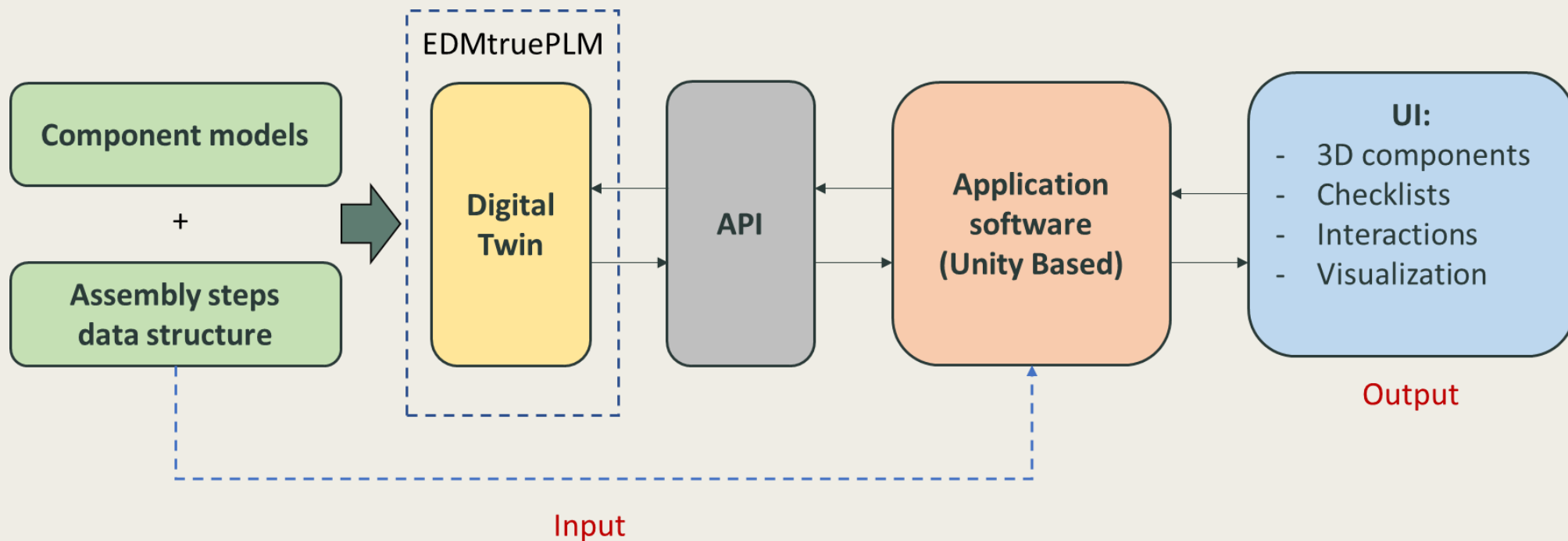


General Architecture of Digital Twin

(POLIMI)



DT based AR supported maintenance and assembly operations architecture



Use Case of Sawmill (Hekotek) Packing Line

- **Goal:** Implementation of a DT, AR Industry 5.0 UX assisted machine maintenance and servicing supported by ZSM 5G data exchange
- **Description:** This use case uses a blueprint for data sharing that relies on open standards based DTs. The use case also demonstrates how AR software/tools can be used for machine service operations and assembly processes based on DT and 5G connectivity
- **Key Challenges:** Design and implementation of open standards based DT and AR solutions, dealing with hybrid sources of data models, remote operation, efficient data exchange on 5G network, fetching and integration of the available data in a UI application allowing improved 3D/XR visualization for machine maintenance.
- **Expected Benefits:** Recommendations for DT use in small scale industry (of SMEs).
- **Roles of participants:** POLIMI and Jotne - main implementers. Hekotek - pilot owner. Athonet and Tieto-SE - secure connectivity providers. TalTech - local support for Hekotek in piloting.



Hekotek Packing Line DT-based AR Services/Applications

- The objective of AR based application in the Hekotek case is to **facilitate technicians** with advanced tools to support the **maintenance operation** on the packing machine.
- The **application queries the data from the DT** of the selected machine and displays it to the user.
- The Operator will be able to see the **augmented instructions in the place** where the action must be performed.
- The digital content visualization is activated via **QR code** and **marker** recognition

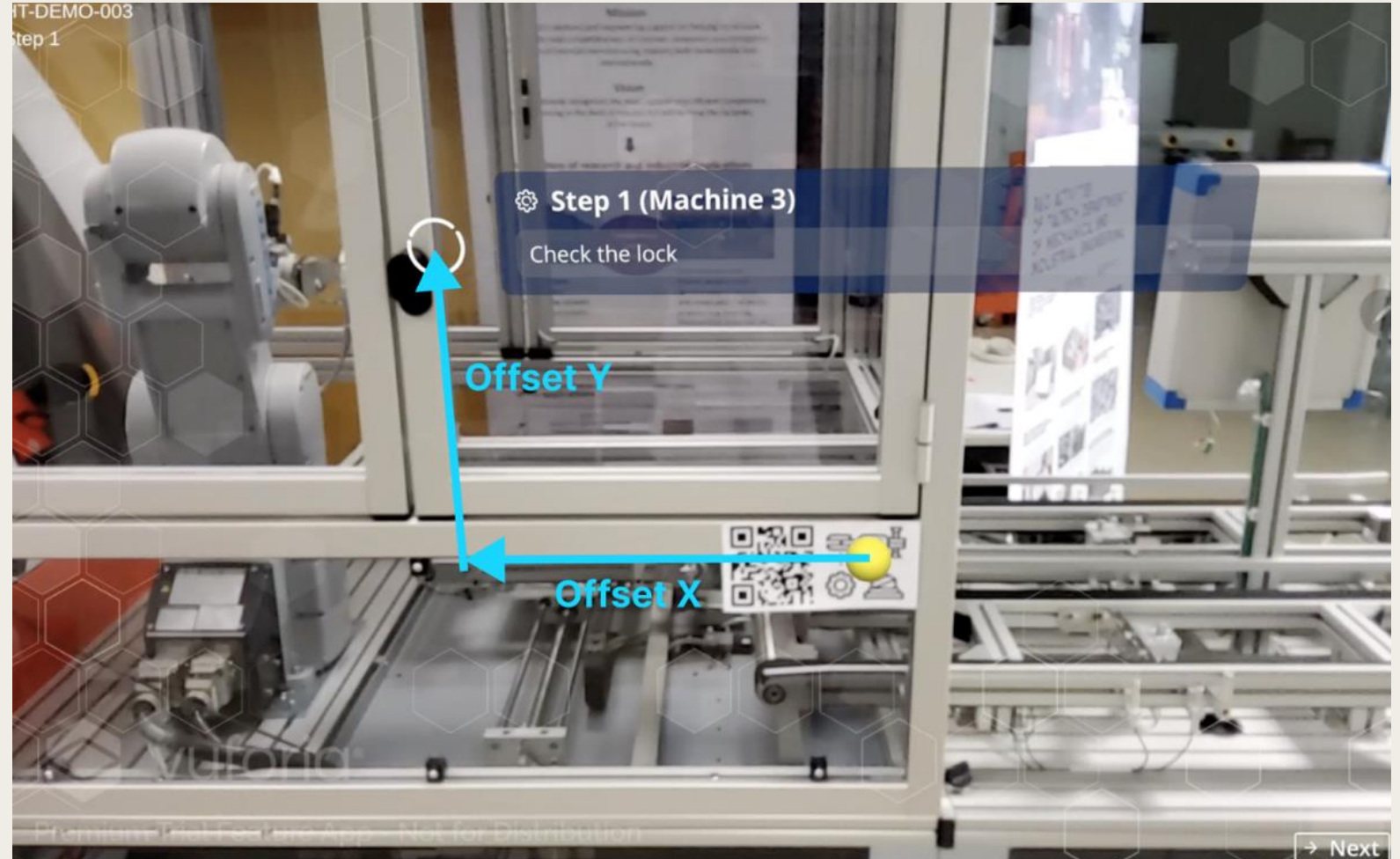
Demo of DT-based AR Services/Applications



The application is initially developed on a **local laboratory testbed**

(FESTO flexible manufacturing system)

The image shows the operator instruction card and the offset from the targeted QR code



Next steps for Packing Line Case

- **Integrating** machine DT and maintenance instruction **data** (when available)
- **Initial testing** of QR code or targets **on physical machine**
- **Test data fetching** with the available repositories on local 5G connectivity

Use Case of Wooden Houses Assembly (Harmet)



- **Goal:** Implementation of a DT, AR Industry 5.0 UX assisted production supported by ZSM 5G data exchange
- **Description:** The use case aims at improvement of efficiency, safety and quality based on the development of DT of the product and production system. This will be synchronized over 5G network to implement AR, and I5.0 assisted production processes and operator support.
- **Key Challenges:** Implementation of DT of the product and PLM repository, efficient data exchange on 5G network, fetching and integration of the available data in a UI application allowing improved 3D/XR visualization of the assembly tasks.
- **Expected Benefits:** Operator training time reduction, improved production efficiency, improved NC report and NC reduction.
- **Roles of participants:** Athonet and Accelleran - 5G infrastructure (Core, RAN) preparation. TalTech - AR solution provider. POLIMI and Jotne - DT solution provider. TietoSE - data exchange for DT. Harmet - pilot site owner.



Assembly Operation DT-based AR Services/Applications

The objective of AR application in the Harmet case is to **assist operators in product assembly** on the production floor.

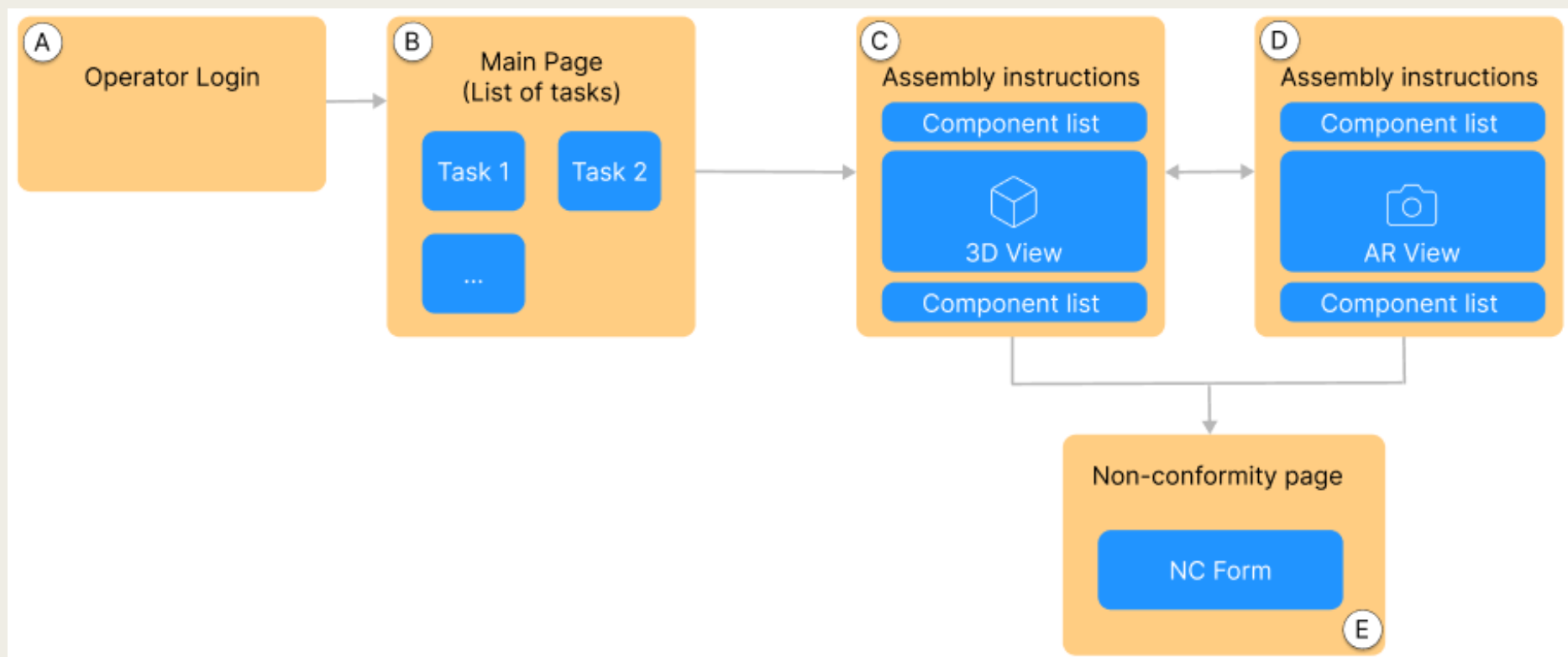
The AR based UI provides a **dynamic visualization of the product and component models, in addition to assembly steps along the construction process.**

The **application queries the data** of the selected product together with related assembly steps **from the PLM repository (DT)** and displays it to the user.

Through the application the operator is able to **always access updated drawings and instructions** (in 3D AR view) and **report product nonconformities.**

Assembly Operation DT-based AR Services/Applications


The application includes several pages and functions including: **login page (A)**, **task list and navigation (B)**, **assembly instructions (with dynamic visualization)(C D)**, **nonconformity reporting (E)**.



Assembly Operation DT-based AR Services/Applications



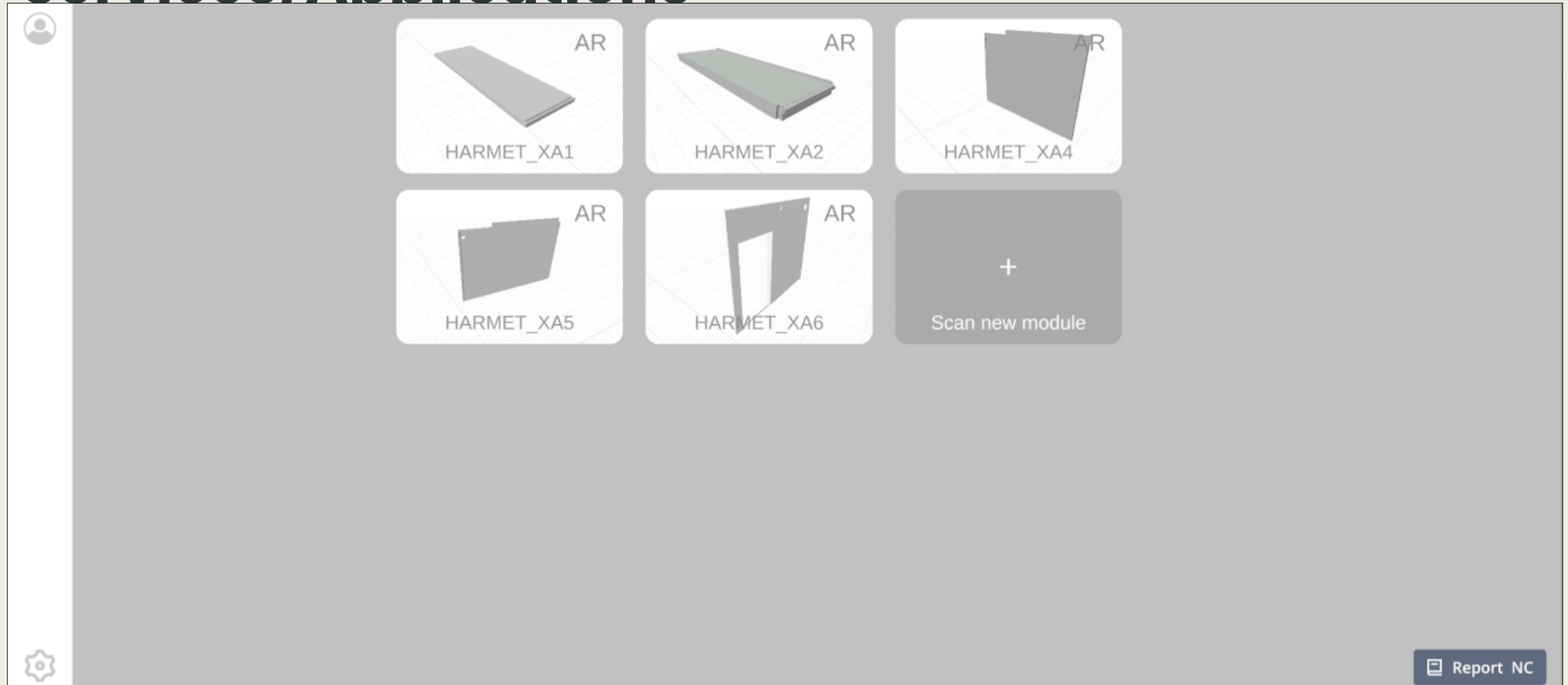
5GT Harmet AR

 Email Login

 QR Login

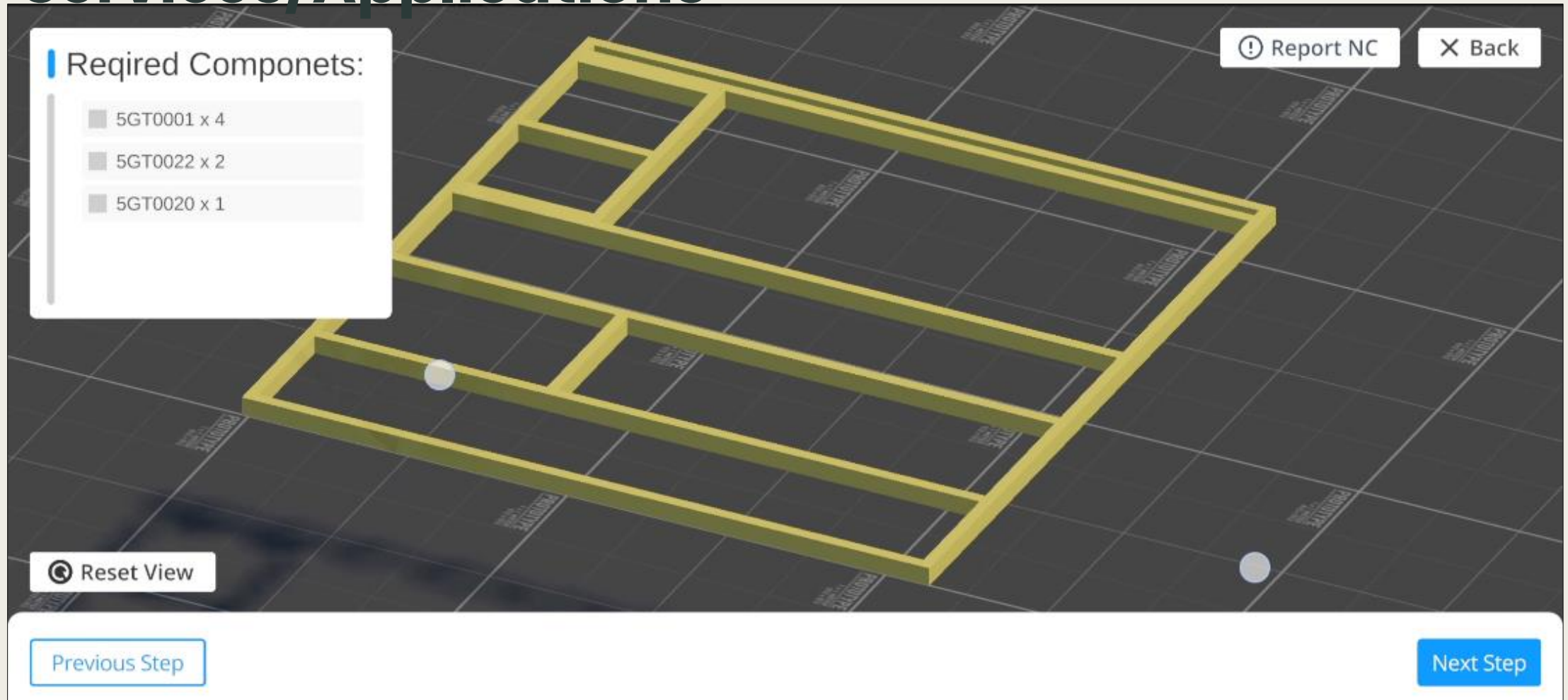
Operator Login page

Assembly Operation DT-based AR Services/Applications



Main page, product list and navigation

Assembly Operation DT-based AR Services/Applications



Assembly step page

Assembly Operation DT-based AR Services/Applications



← Back

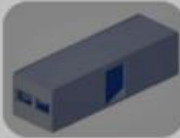



Report NC

Fill in the form to complete NC

Scan Module's QR code

Scan Elements's QR code

Scan Elements's QR code

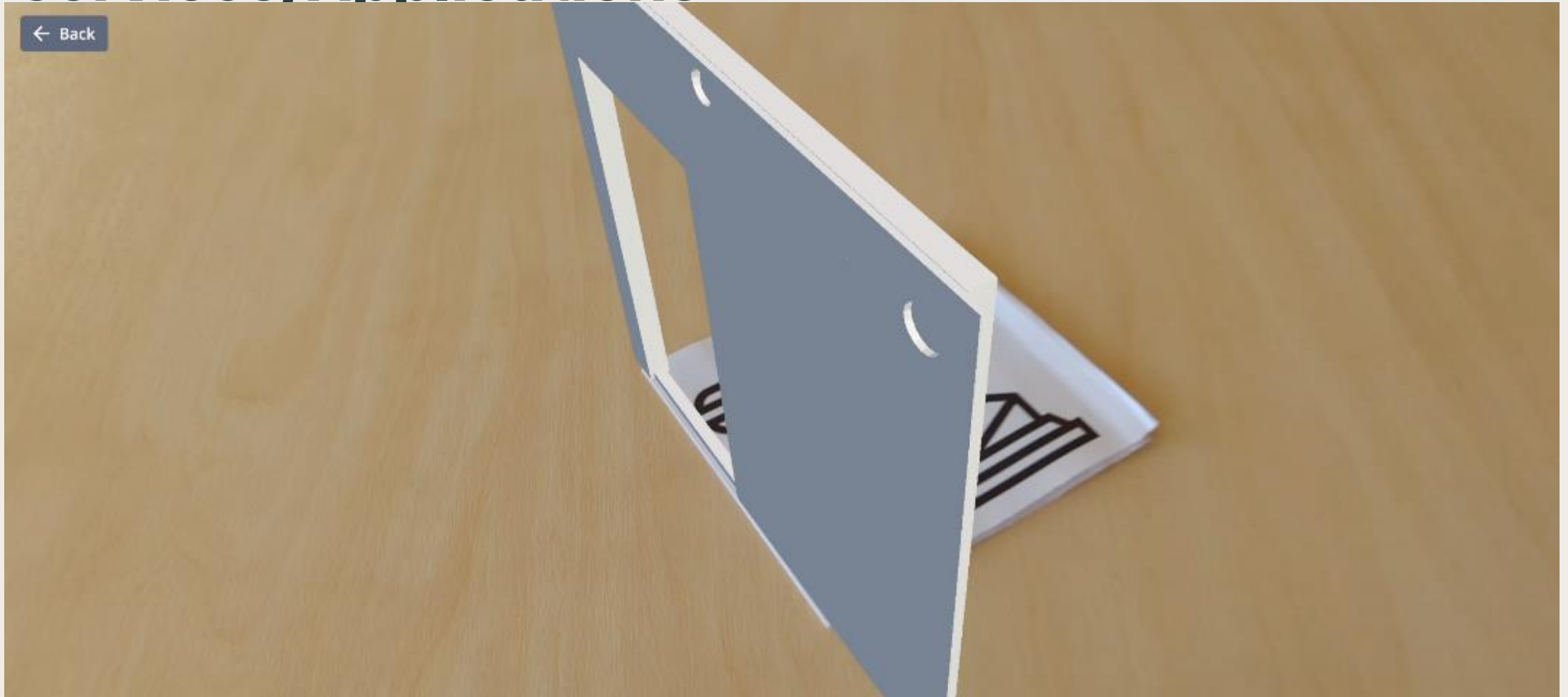
   

Short Description

✓ Done

Nonconformities report page

Assembly Operation DT-based AR Services/Applications



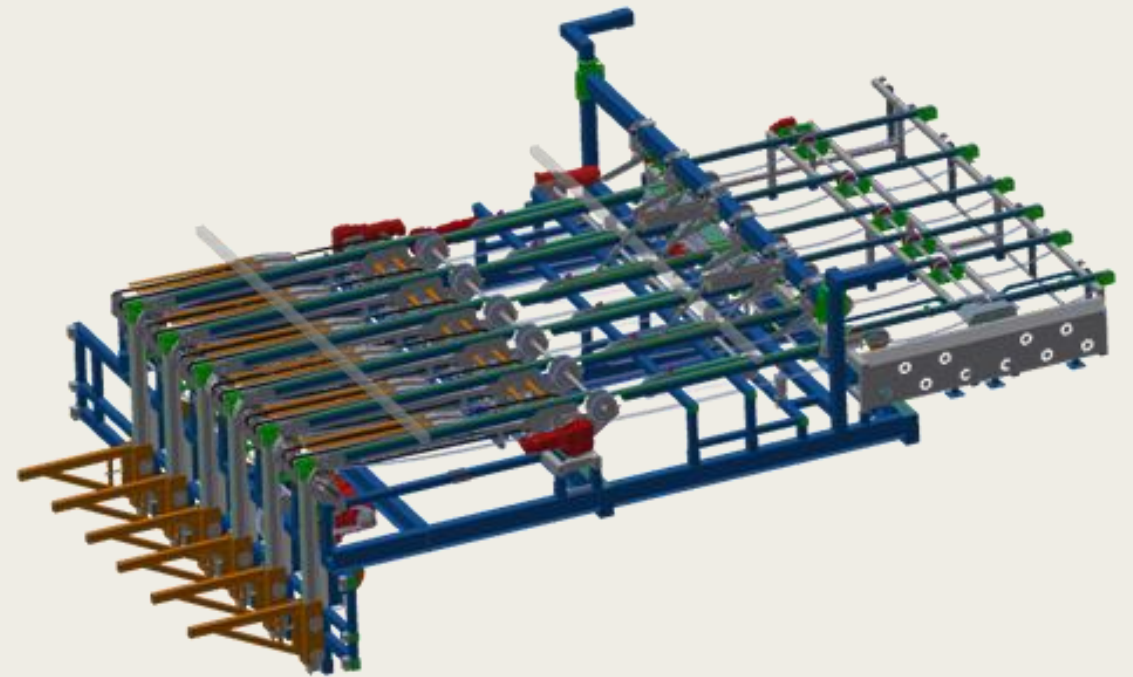
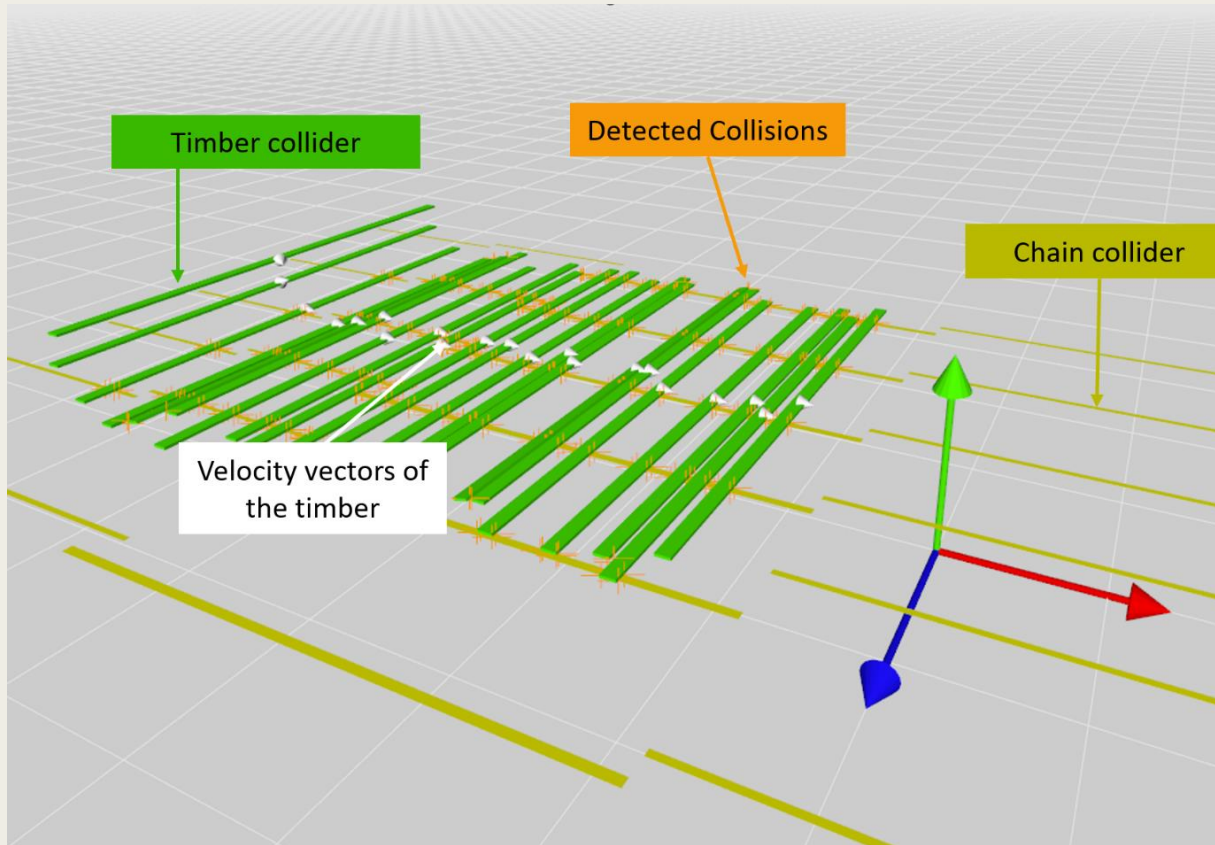
Product module AR view

Next steps for Assembly Operation of Wooden Modules

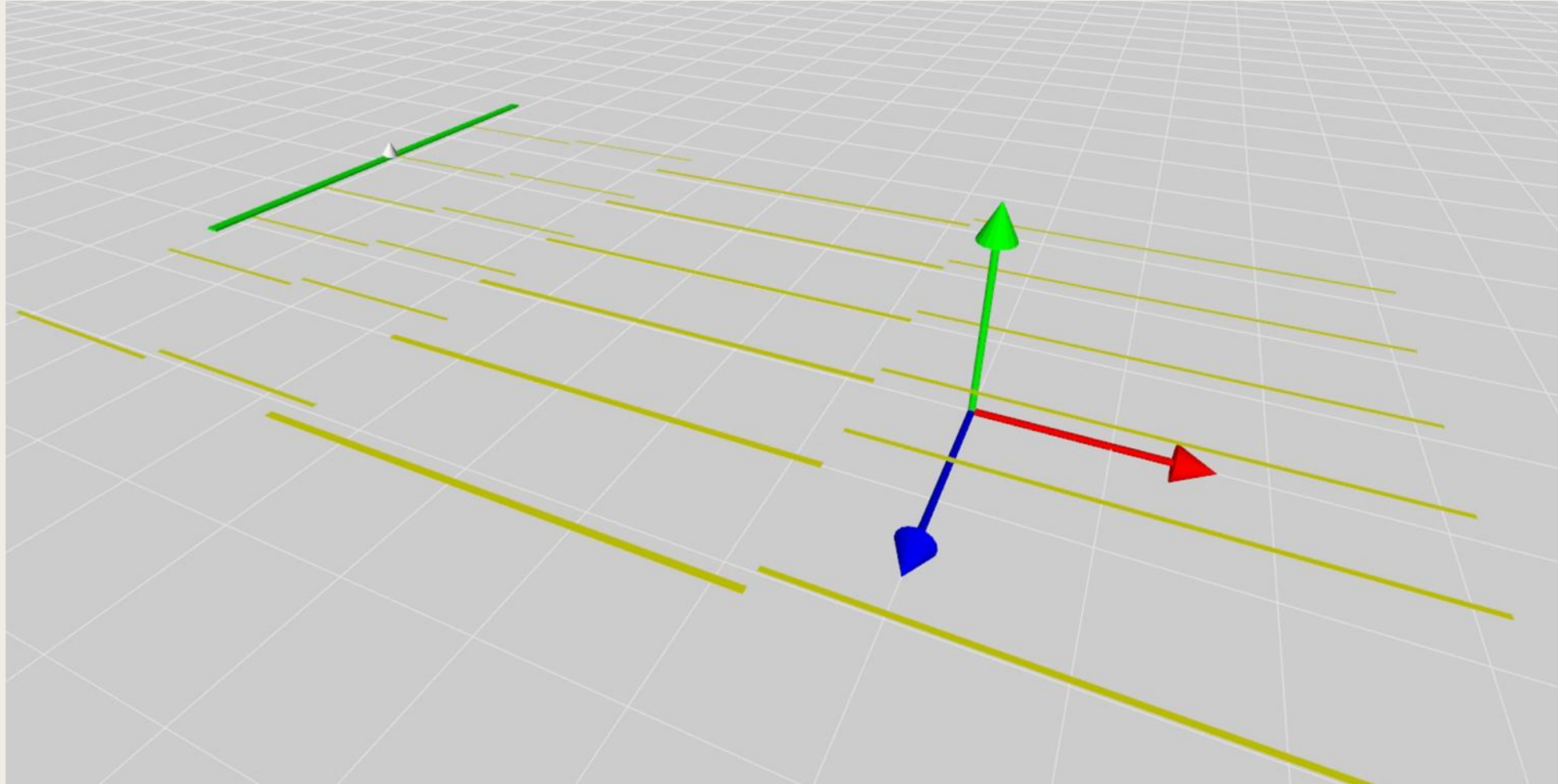


- Finalizing the UI nonconformity reporting
- **Integrating machine DT and assembly instruction data** (when available)
- Improvement and integration of company feedback on application UI
- **Test data fetching** with the available repositories on local 5G connectivity

DT development of Hekotek Packing Line (POLIMI)



DT development of Hekotek Packing Line (Video)



Discussion



The floor is open for questions and comments