1st Accelerators Technology Sector Workshop

Engineering Design Tools and Processes
Project Management Methodologies and Tools

Chair: Mike Lamont

Interconnecting knowledge, experience, methods, people & data to foster learning & collaboration

CERN

ATS
Accelerators and Technology Sector

Transforming engineering processes with the new Product Lifecycle Management (PLM) platform

Claudio Scoero

ATS
Accelerators and
Technology Sector

What is a PLM platform?

PLM (Product Lifecycle Management)

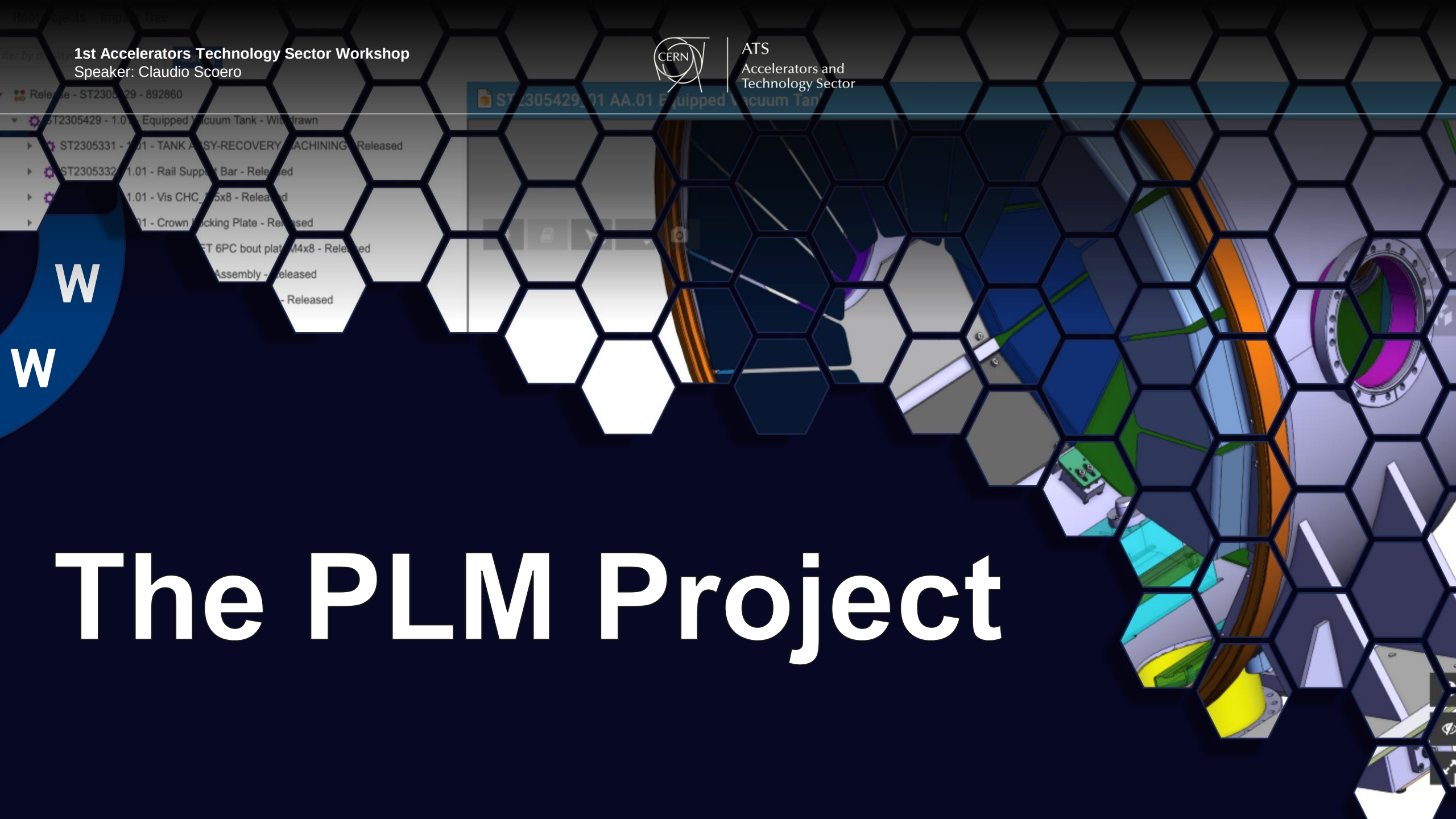
- **Centralizes** all product information in one location
- Allows the access to **relevant information at every stage** of the product lifecycle
- Manages engineering **business processes** (data verification, ECR, etc…)
- **Backbone** that integrates with other systems, **acting as «single source of truth»** for engineering data

Some PLM challenges at CERN

- **Complex and technically advanced environment**
  LHC + detectors: some 100 million high-tech components.
- **Large international collaborations**
  Typical particle detector experiment is >2000 people, located on 5 continents often using different CAD tools.
- **Very long lifecycles**
  Our installations have lifecycle of 30-50 years.
- **Traceability**
  Strict traceability of equipment and detailed techn. documentation.
- **Quality** and control **vs. Innovation** and research

Credits: CERN

CERN
ATS
Accelerators and
Technology Sector

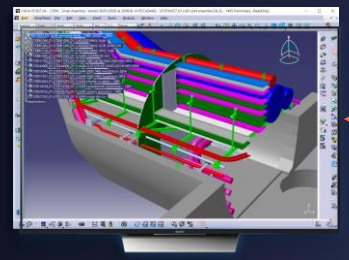


The PLM Project

Why the PLM Project?

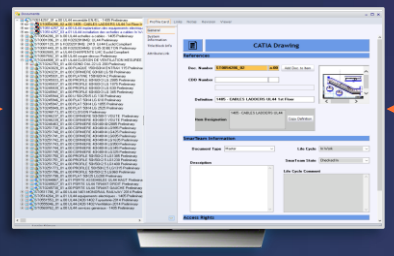
- Trigger: **SmarTeam end of support**
- Multiple systems used by Engineering community: SmarTeam, CDD and EDMS
  - Heavy data synchronization
  - Hard to maintain this ecosystem

CATIA



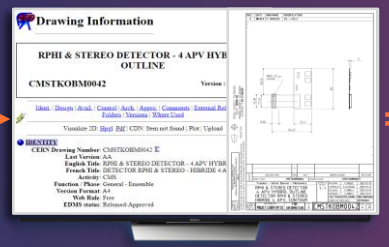
CATIA V5 data

SmarTeam



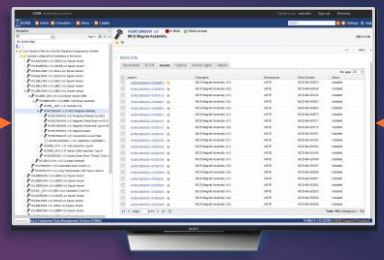
EBOM

CDD
CERN Drawing Directory



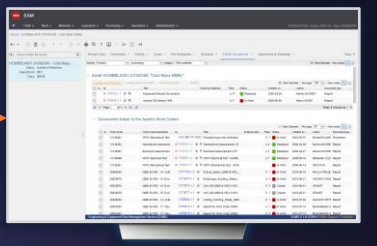
Drawings archive
Verification

EDMS
Engineering Document Management System



Engineering Documents
Engineering Change
Hardware Baselines

EAM
Enterprise Asset Management



Asset Management

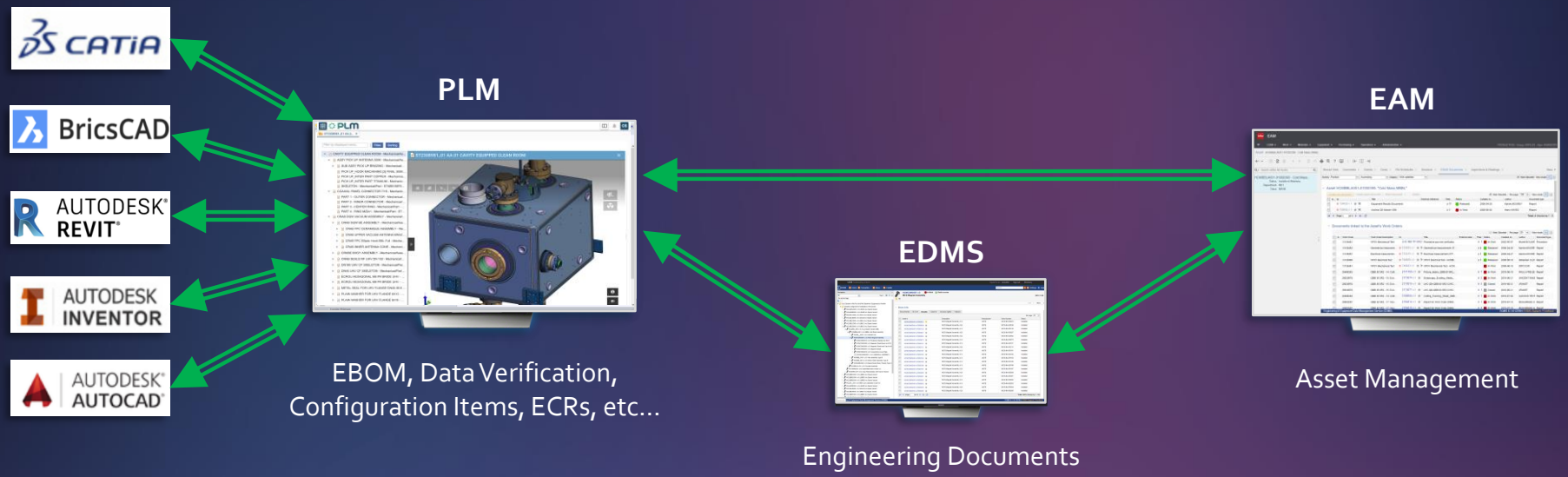
Revit, AutoCAD and other CAD tools

What is the scope of the PLM Project?

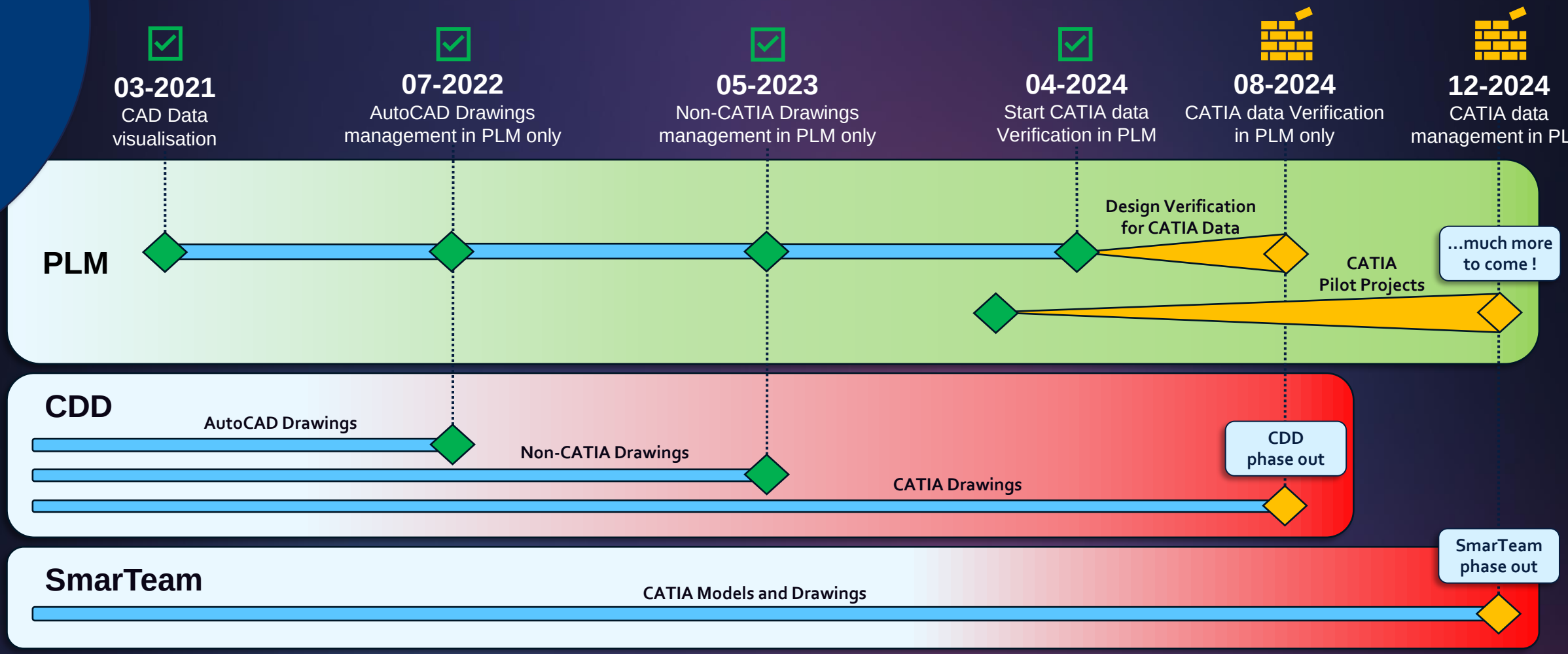
- **Replace SmarTeam and CDD with an integrated CERN Engineering Platform**
  - Reduce the number of tools for the users
  - Provide better service

+ **MultiCAD support** → All Design Offices can work with it!
  - CATIA for Mechanical CAD
  - AutoCAD, BricsCAD, Inventor, Revit for other disciplines, …

+ **Part Centric methodology**
  - Link with physical equipment
  - Enabler of the Digital Thread



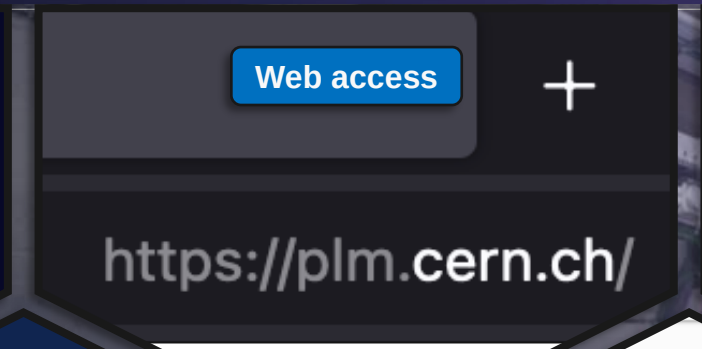
Project Milestones

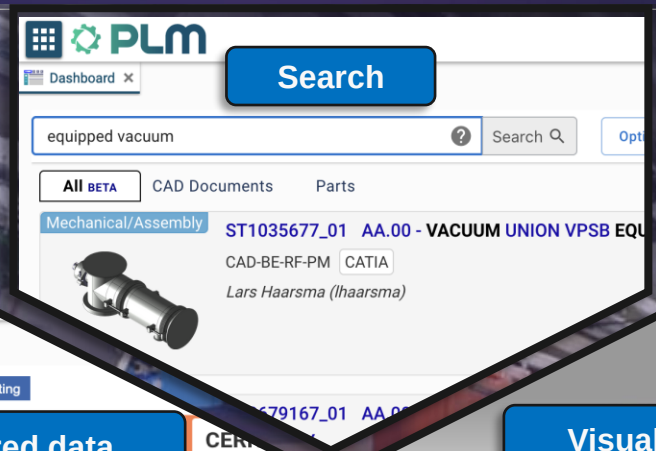


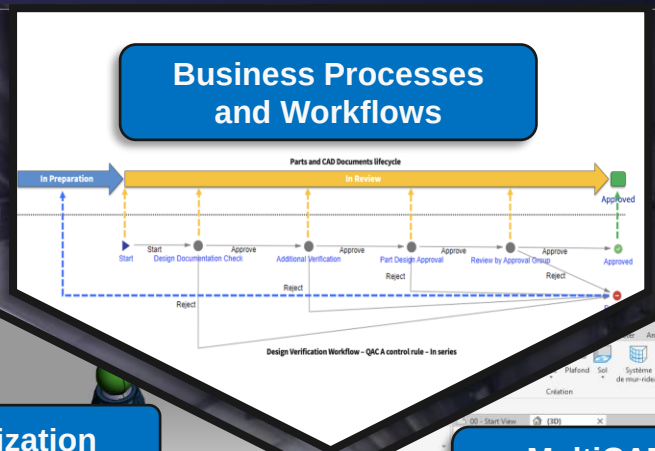
What is already in Production?

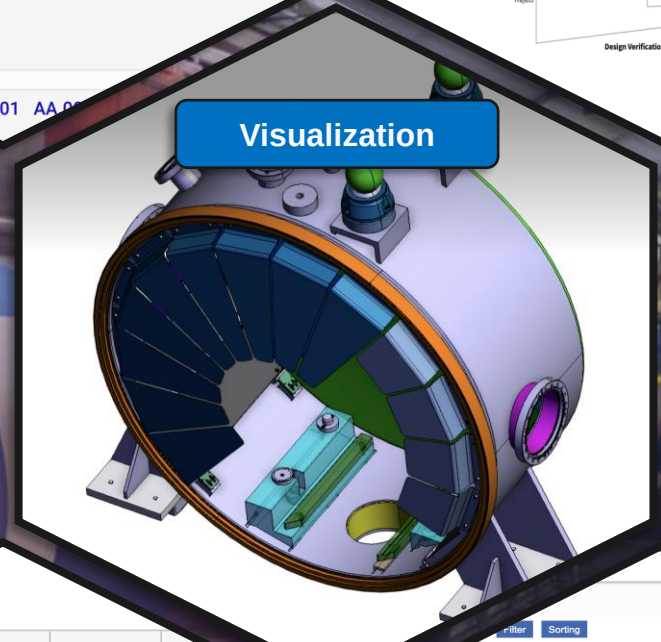
Credits: CERN

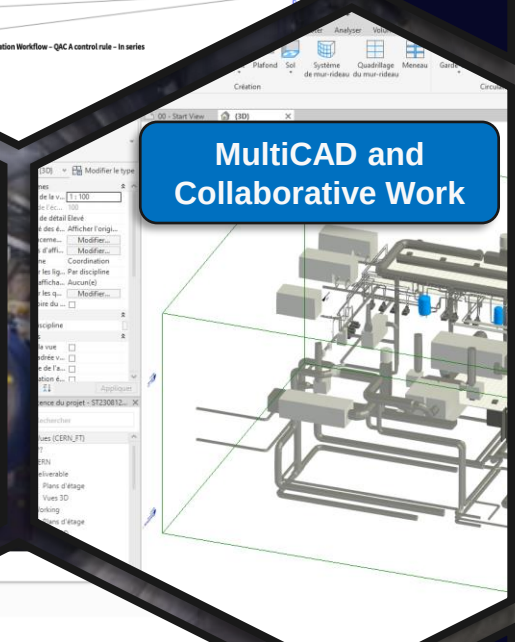
Some of the CERN PLM Core capabilities

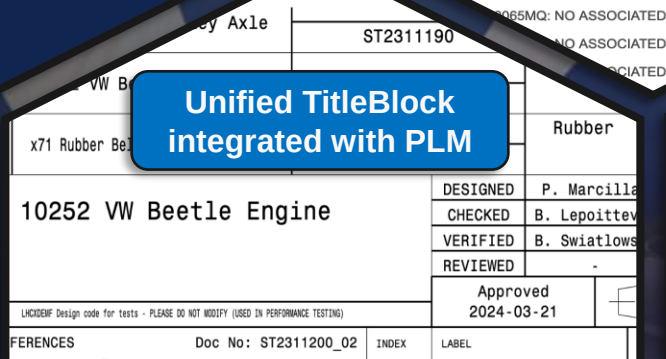


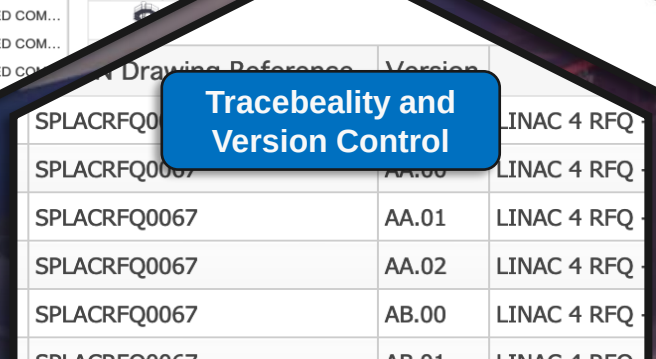


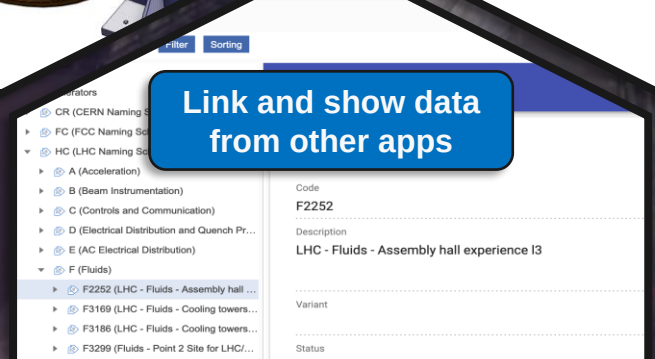




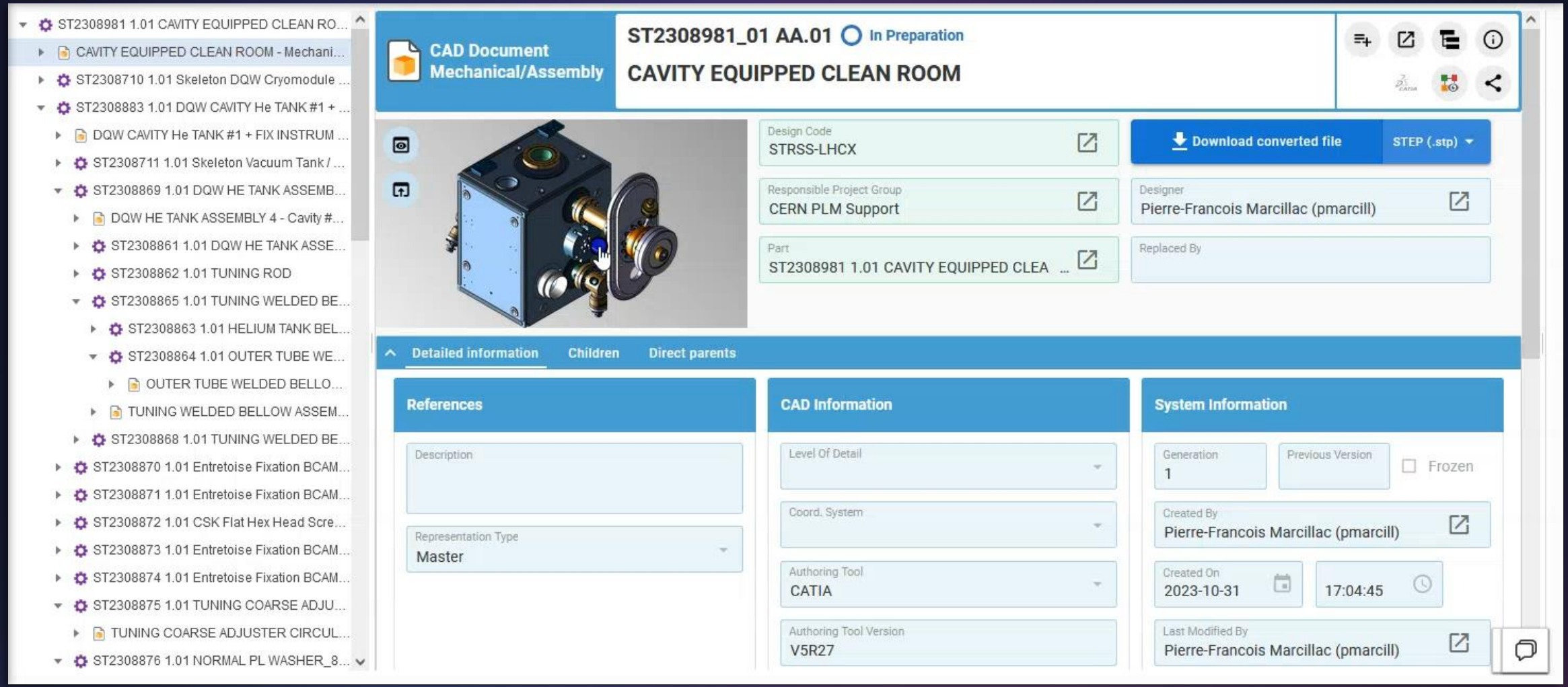








Web Viewer


ST2308981 1.01 CAVITY EQUIPPED CLEAN RO...
CAVITY EQUIPPED CLEAN ROOM - Mechani...
ST2308710 1.01 Skeleton DQW Cryomodule ...
ST2308883 1.01 DQW CAVITY He TANK #1 + ...
DQW CAVITY He TANK #1 + FIX INSTRUM ...
ST2308711 1.01 Skeleton Vacuum Tank / ...
ST2308869 1.01 DQW HE TANK ASSEMB...
DQW HE TANK ASSEMBLY 4 - Cavity #...
ST2308861 1.01 DQW HE TANK ASSE...
ST2308862 1.01 TUNING ROD
ST2308865 1.01 TUNING WELDED BE...
ST2308863 1.01 HELIUM TANK BEL...
ST2308864 1.01 OUTER TUBE WE...
OUTER TUBE WELDED BELLO...
TUNING WELDED BELLOW ASSEM...
ST2308868 1.01 TUNING WELDED BE...
ST2308870 1.01 Entretoise Fixation BCAM...
ST2308871 1.01 Entretoise Fixation BCAM...
ST2308872 1.01 CSK Flat Hex Head Scre...
ST2308873 1.01 Entretoise Fixation BCAM...
ST2308874 1.01 Entretoise Fixation BCAM...
ST2308875 1.01 TUNING COARSE ADJU...
TUNING COARSE ADJUSTER CIRCUL...
ST2308876 1.01 NORMAL PL WASHER_8...
CAD Document
Mechanical/Assembly
ST2308981_01 AA.01
In Preparation
CAVITY EQUIPPED CLEAN ROOM
Design Code
STRSS-LHCX
Download converted file
STEP (.stp)
Responsible Project Group
CERN PLM Support
Designer
Pierre-Francois Marcillac (pmarcill)
Part
ST2308981 1.01 CAVITY EQUIPPED CLEA ...
Replaced By
Detailed information
Children
Direct parents
References
Description
Representation Type
Master
CAD Information
Level Of Detail
Coord. System
Authoring Tool
CATIA
Authoring Tool Version
V5R27
System Information
Generation
1
Previous Version
Frozen
Created By
Pierre-Francois Marcillac (pmarcill)
Created On
2023-10-31
17:04:45
Last Modified By
Pierre-Francois Marcillac (pmarcill)

Digital Twin

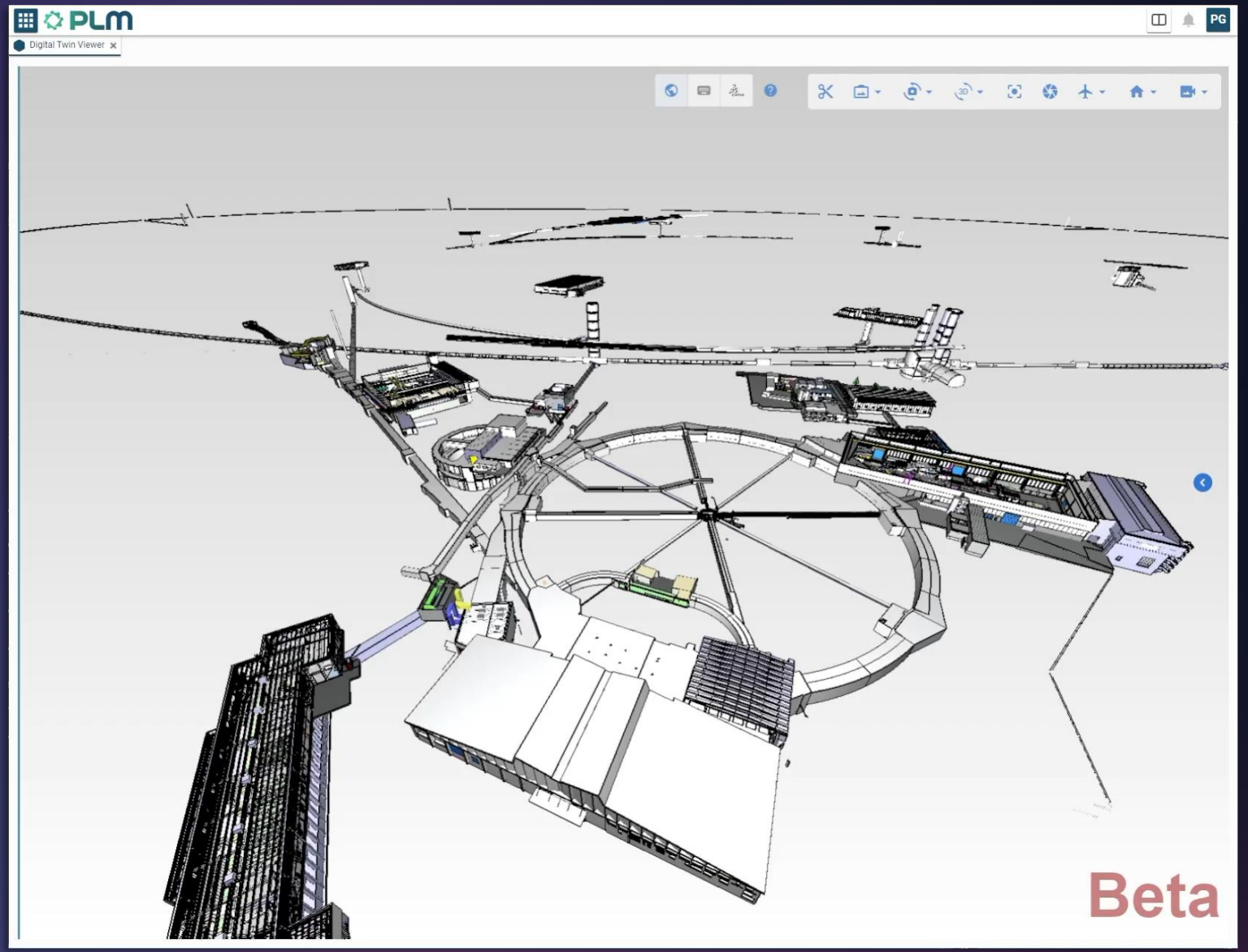
3D navigation of Accelerators & Detectors complex using Layout and CAD data

Goal

Augment with links and data feeds from PLM, EAM, Layout, SCADA…

Applications

- Training before Interventions, VR, AR
- Visualisations for Integration, Coordination, Configuration Management
- Safety, Work Dose Planning
- High-Fidelity tests of Digital Model
- ……



Available at: https://plm.cern.ch/prod/Client/?StartItem=CERN_DigitalTwinViewer

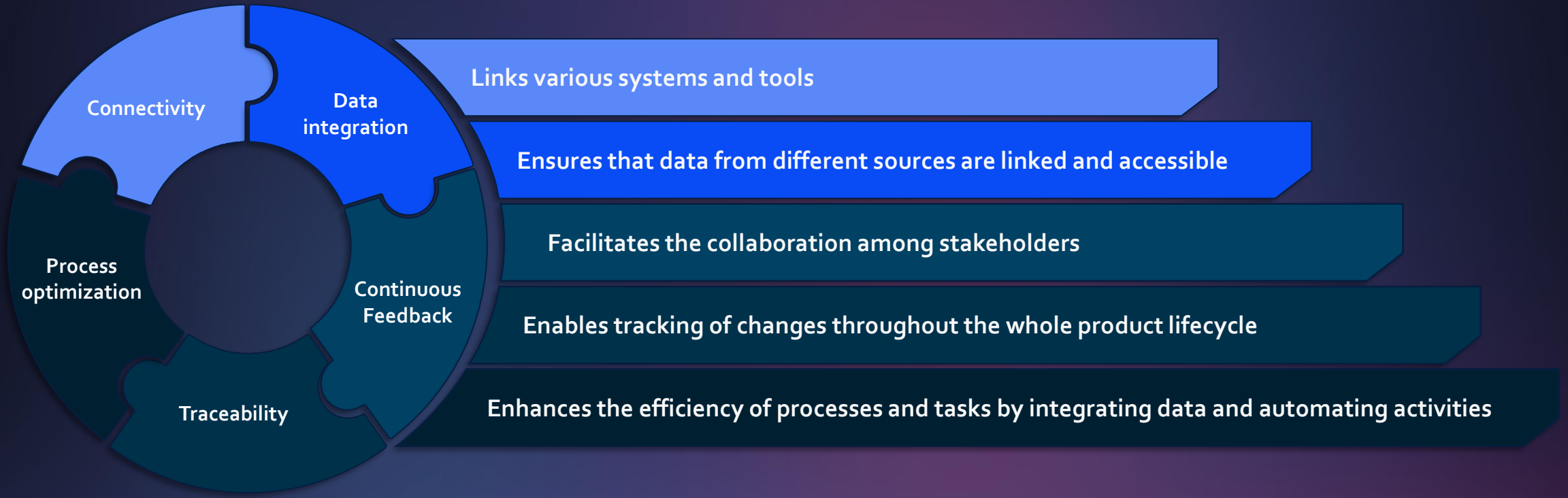
Enhancing the Digital Thread at CERN

Credits: LinkedIn

What is the Digital Thread?

The **Digital Thread** means **integrating data** and information from multiple systems **across the lifecycle of a product**, from design and manufacturing to operation and maintenance.

It ensures the **accessibility** of relevant information **at every stage**.



CERN's engineering system landscape is similar to an archipelago


EDMS
EAM
SCADA
Survey
Simulations
Layout DB
PLM
...
CAD Tools
Other engineering application
We need to build up the bridges together

PLM as reference for engineers

Integrated Platform

Gradually link applications and data into a common engineering platform

Data visualization

Provide relevant engineering information, from multiple angles & in different formats

Business Processes

Increasingly support more engineering business processes with the platform

Digitalized workflows

Make the PLM evolving into the EDH for the engineering community

Please come and talk with us before building another island !

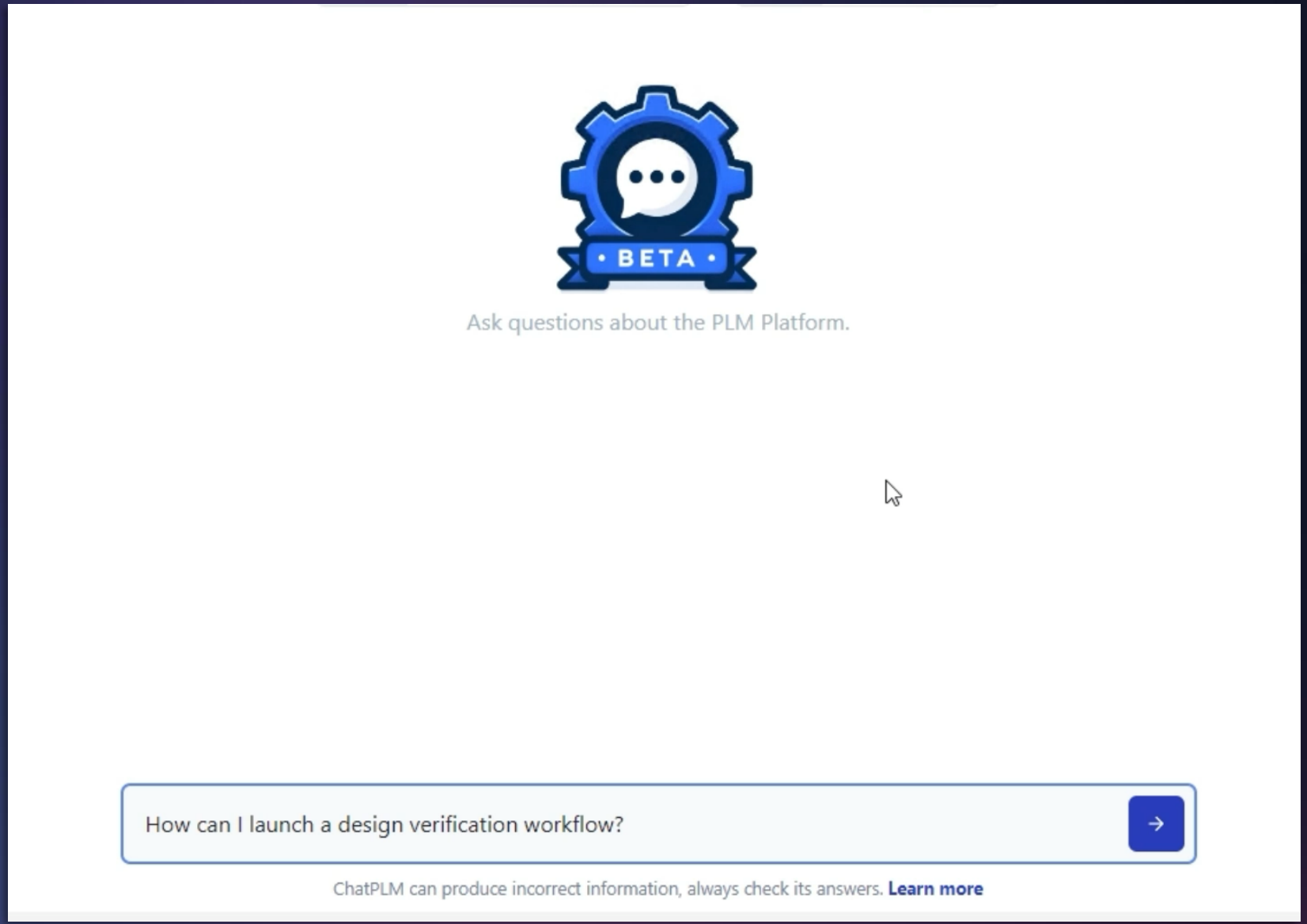
Credits: LinkedIn

AI - ChatPLM

The implementation of a **robust Digital Thread** becomes **extremely important** for the future, as we have more and more **AI assistance** in our daily work

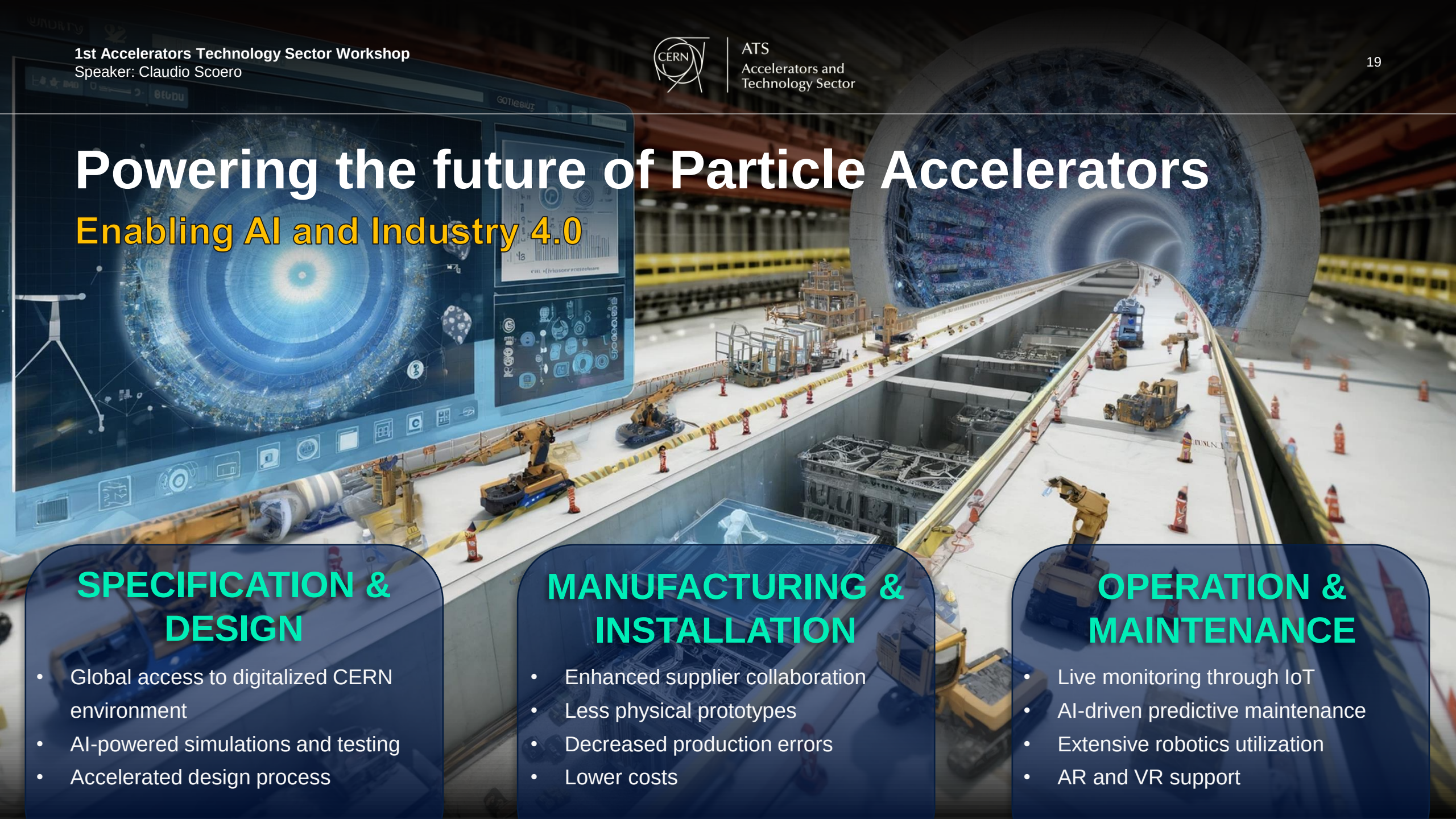
Current status

- Convenient way to **find answers** to questions about the platform
- **Based on** the content of the **available documentation**
- Provides **links to** the related **documentation**



Powering the future of Particle Accelerators

Enabling AI and Industry 4.0



SPECIFICATION & DESIGN

- Global access to digitalized CERN environment
- AI-powered simulations and testing
- Accelerated design process

MANUFACTURING & INSTALLATION

- Enhanced supplier collaboration
- Less physical prototypes
- Decreased production errors
- Lower costs

OPERATION & MAINTENANCE

- Live monitoring through IoT
- AI-driven predictive maintenance
- Extensive robotics utilization
- AR and VR support

Powering the future of Particle Accelerators

Enabling AI and Industry 4.0

Digitalization is the future of engineering !

CERN’s new PLM is a key step toward this and a platform to build on

Thanks for your attention!

Credits: www.examsbook.com