

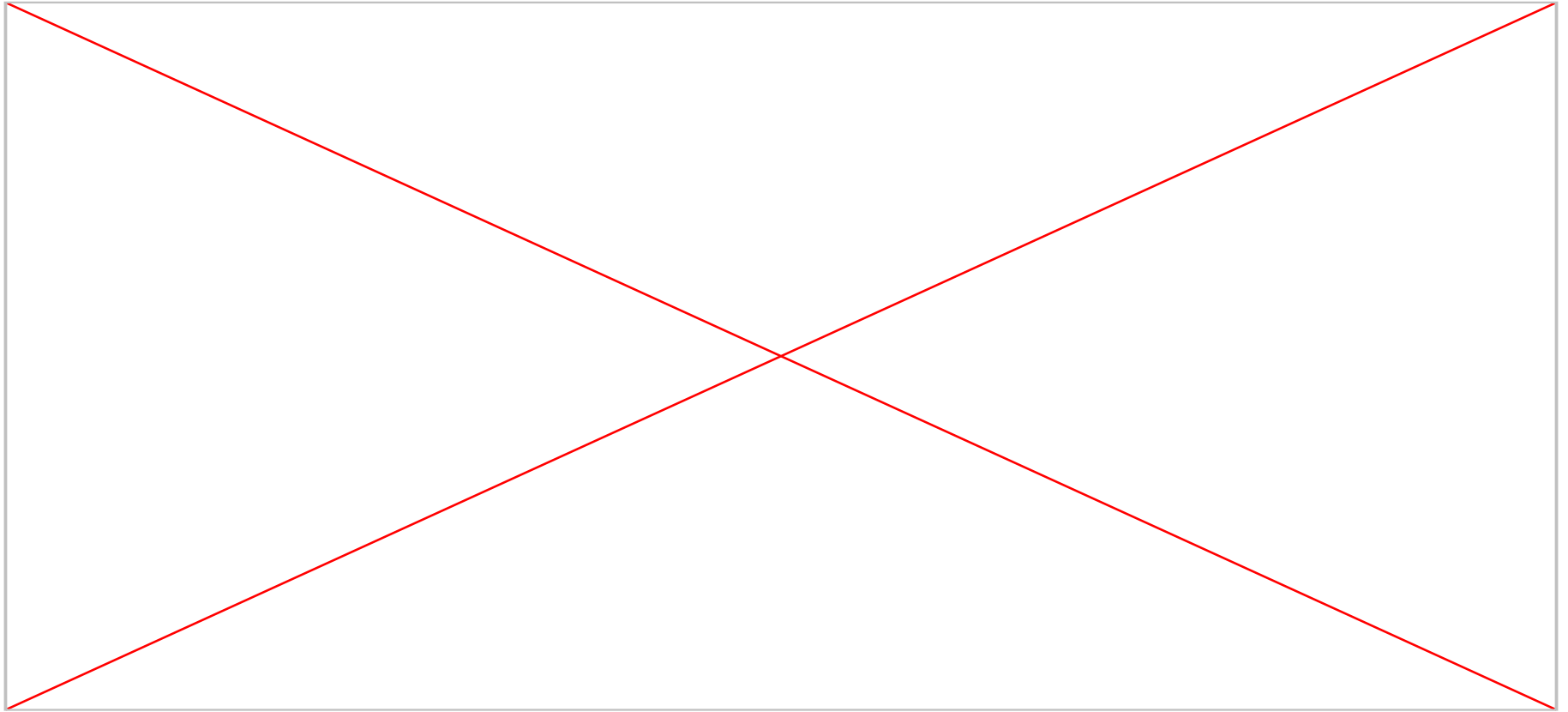
Engineering Digital Twins at CERN

2025 CERN openlab Technical Workshop - EN-IM-PLM

2025-03-05

<https://indico.cern.ch/event/1440389/>

Existing Work



Platform Potential

- **Modular Architecture**

- Python based plugin system - Different groups can build their own plugins
- Easily integrate with existing systems through custom connector plugins
- Specialised tools for specific purposes
- Support for many different CAD and BIM data formats (Including Catia and Revit)
- Separate digital twin applications for each use case, built from the same core
- Fast loading of complex scenes compared to authoring tools

- **Visualisation / Simulation**

- Advanced visualisations through conventional and ray-tracing rendering engines
- Built on Universal Scene Description by Pixar
- Connect to existing simulation software at CERN like GEANT4
- Swap between conventional simulations and surrogate AI models in the same tool
- PhysX-powered simulations for rigid bodies, vehicles, fluids, and collision detection
- AI and Robotics features such as dataset generation for autonomous vehicles

- **Modelling**

- Physics-based simulation of mechanical systems and vehicles
- Intuitive user interfaces to operate digital machinery
- Integration of real-time operational data with 3D visualisation

- **Industry Adoption**

- Already adopted by multiple fusion laboratories, automotive and manufacturing industries

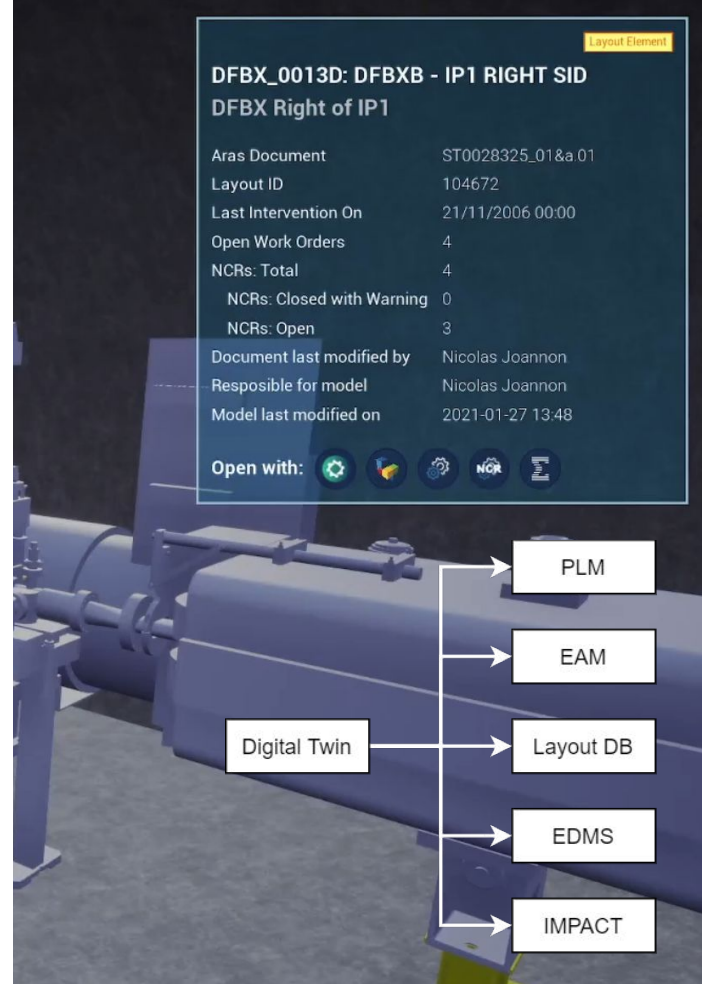
Current Progress

- **2024 - 2 OpenLab Summer Student Projects**
 - Intervention Planning Prototype
 - Navigation Path Finding
 - Access Control Checks
 - Equipment Weight Calculation
- **2024 - Panoramas integration**
 - Align panoramas to CAD models
 - Show panoramas over 3D environments
- **2025 - 2 OpenLab Summer Student Projects**
 - Migrating current digital twin into Omniverse
 - Connecting simplified and complete CAD models
 - Aligning simplified and complete models in 3d space



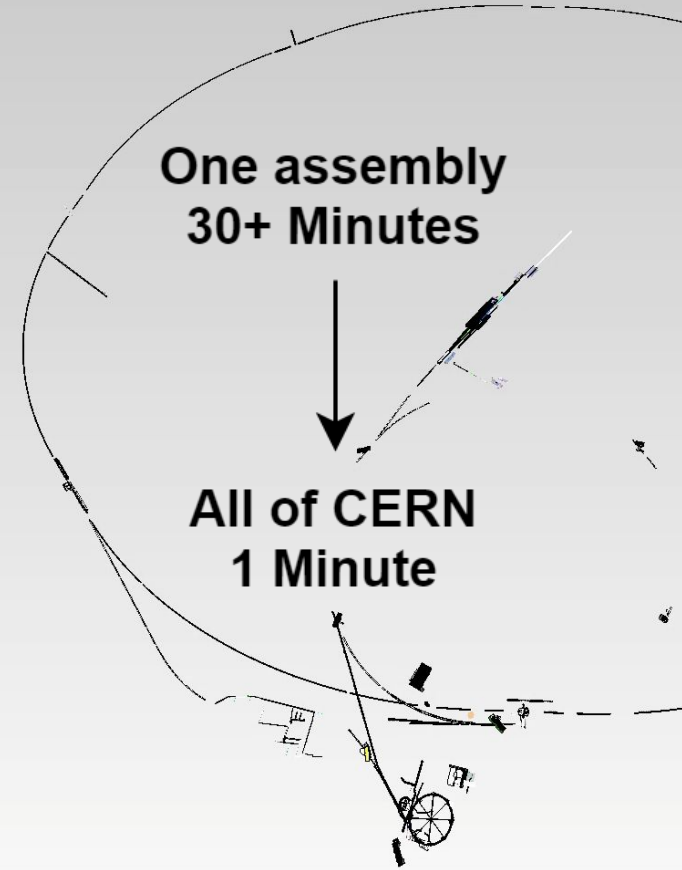
Potential Uses

- Information HUB
- Integration configuration visualization
- Intervention planning
 - Simulation of cranes or vehicles
 - Simulation of radiation exposure
- Simulation of remote controlled missions
- VR training environments
- Scientific visualization
 - Simulated data
 - Detector response visualisation
 - End to End simulation
- And much more



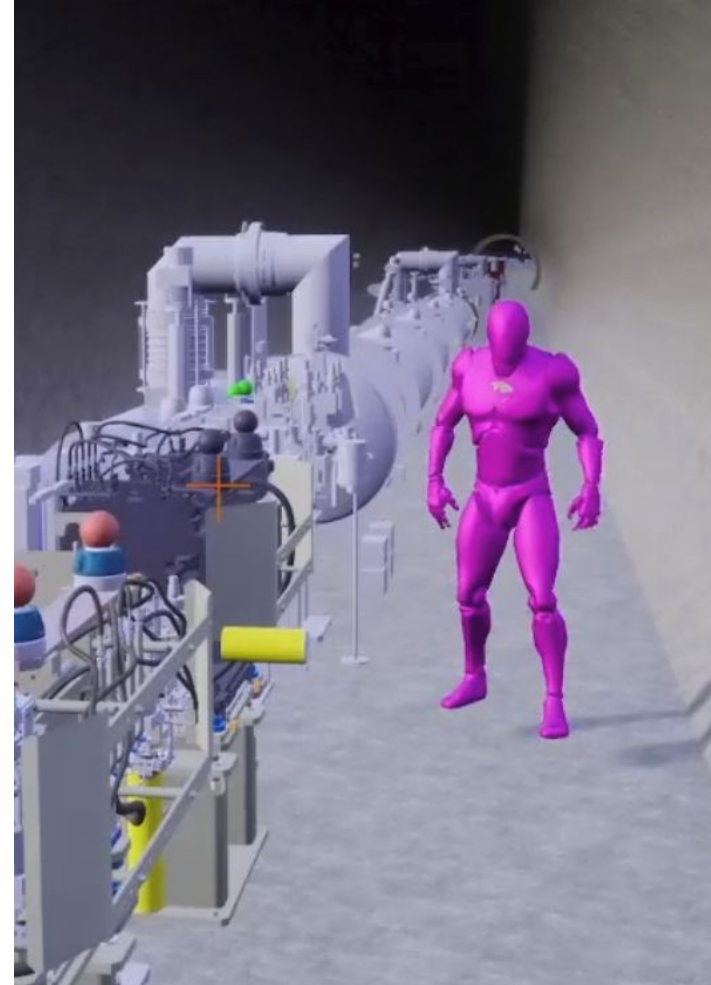
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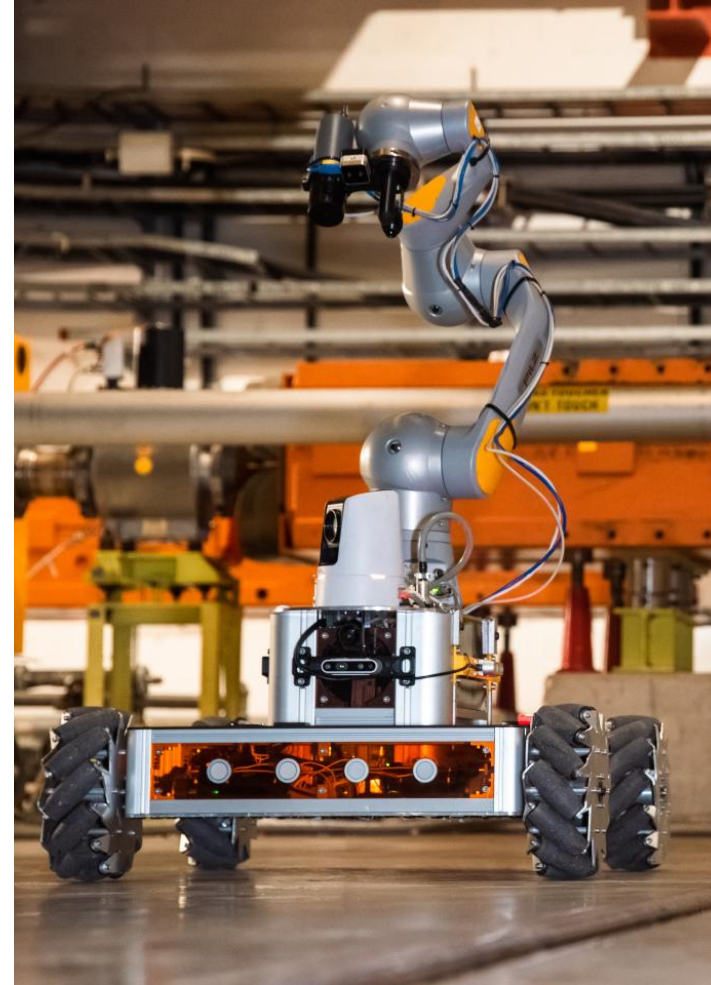
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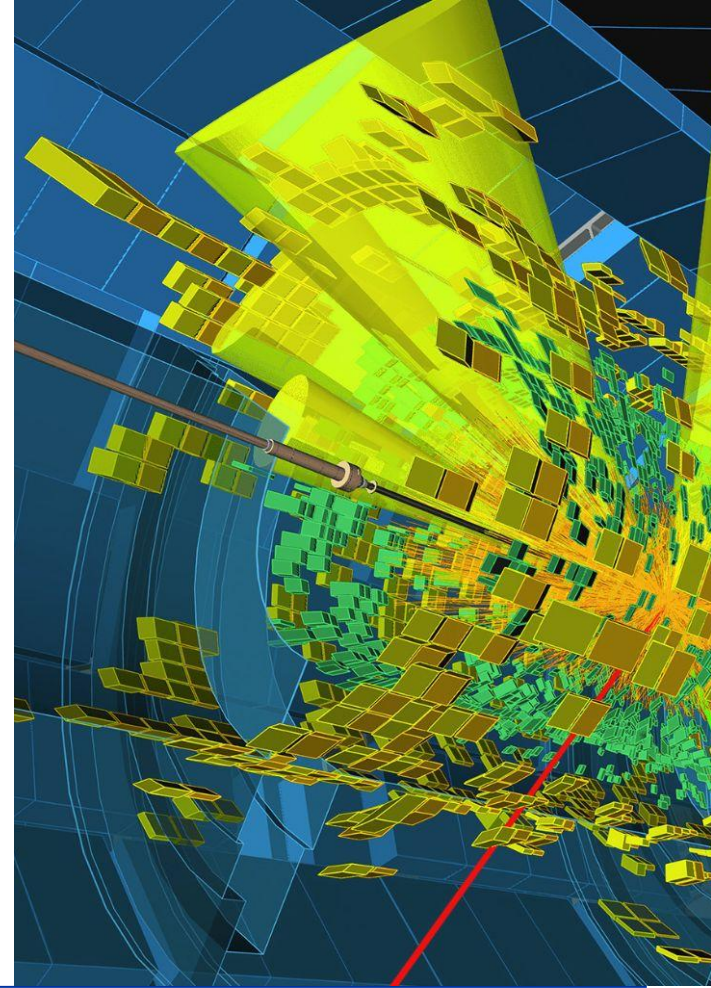
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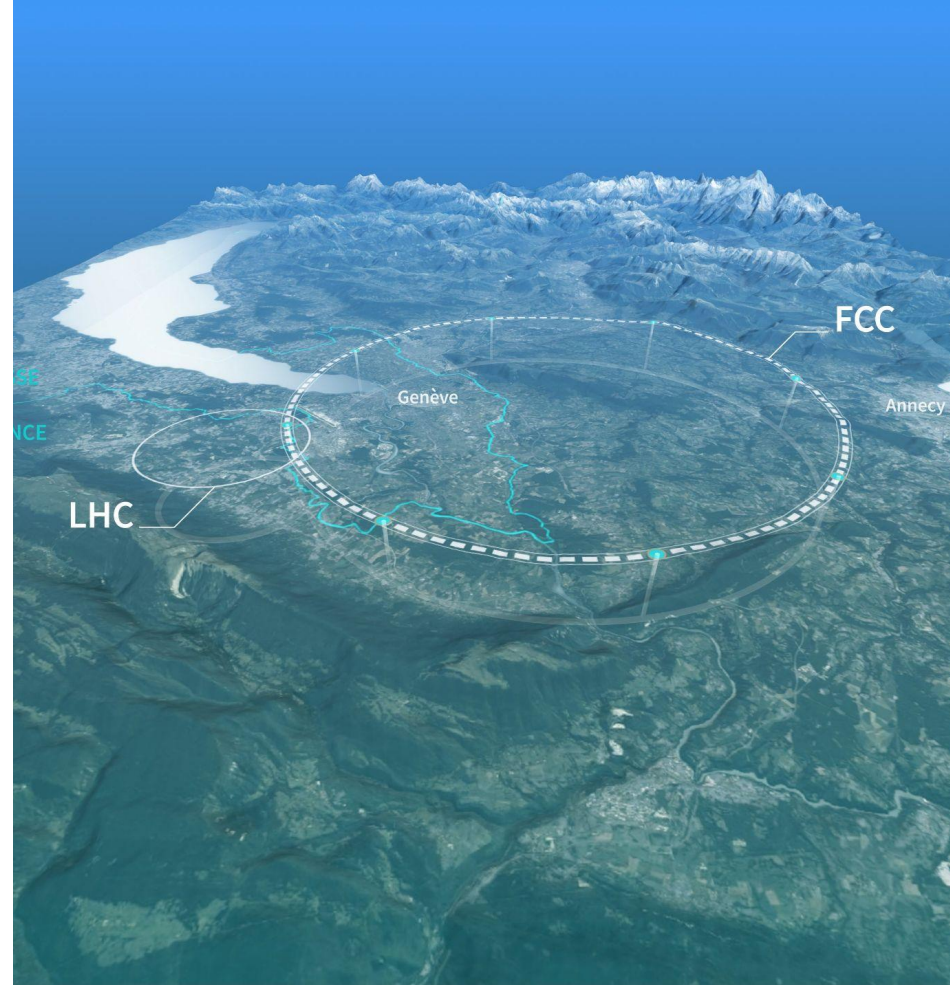
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- **Scientific visualization**
 - **Abstract visualisations of simulation data**
 - **Detector response visualisation**
 - **End to End simulation**
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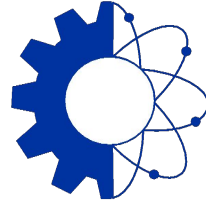
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Feel Free to Contact Us

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