VILNIUS TECH
Vilnius Gediminas Technical University

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Technology Centre for Building Information and Digital Modeling

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Department of Building Energetics

Enhancing Build Environment through Digital Twin Technology Development and Integration

2023-10-05

Agenda

1. VILNIUS TECH Technology Centre for Building Information and Digital Modelling
2. Digital Twin of the Built Environment
3. Digital Twin use cases in Buildings

BIM / PLM in VILNIUS TECH

Considering the **mission** of VILNIUS TECH, the profiles of its specialists,

its faculty structure and its historical development,

the **growth of BIM/PLM technologies** is raised to

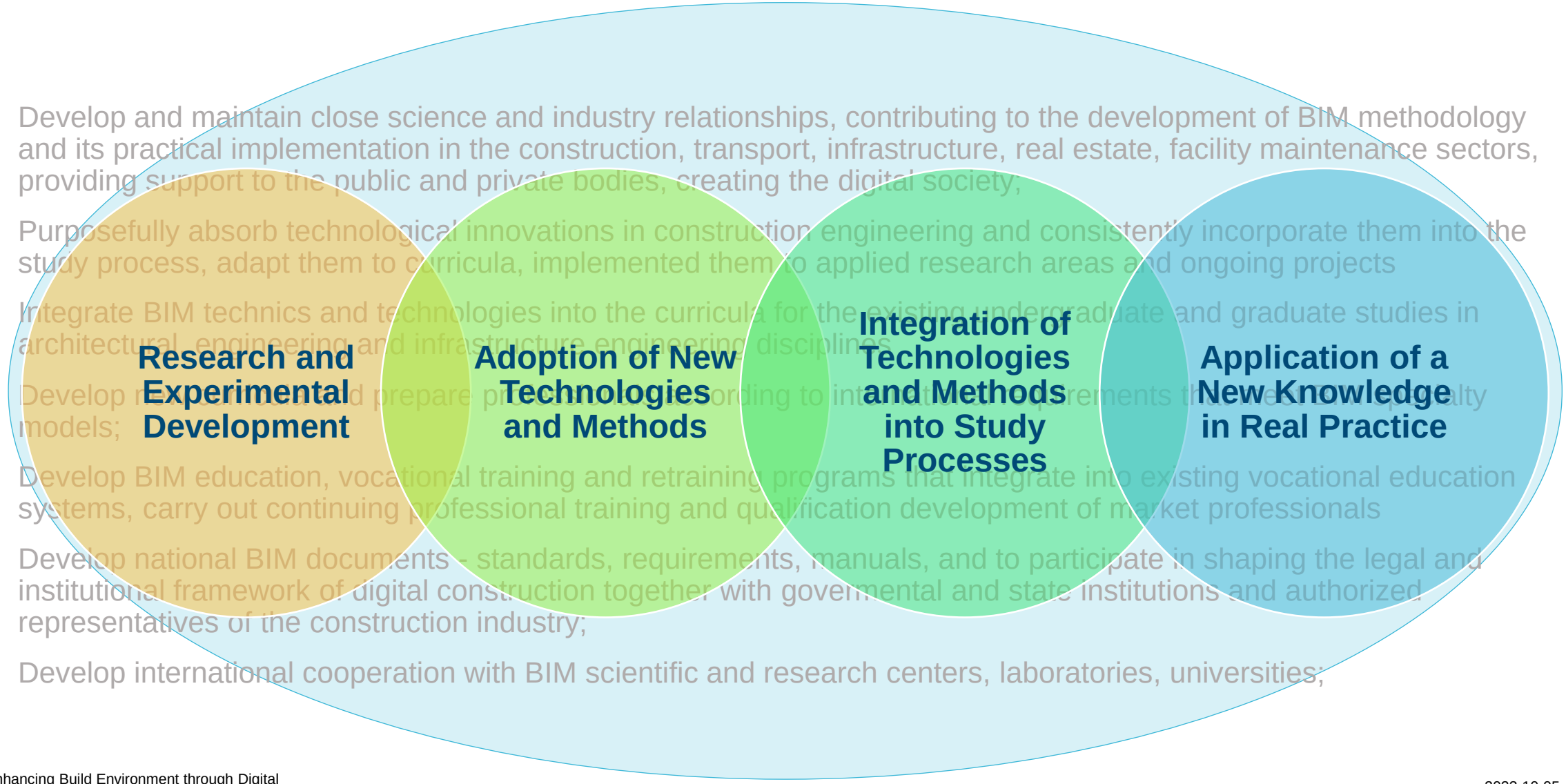
a strategic level in the university's academic and research activities

The Technology Centre for Building Information and Digital Modelling

The Technology Centre for Building Information and Digital Modelling was established at VILNIUS TECH on April 2014.

- Promote the use of BIM methodology
- Raise to a strategic level in the university's academic and research programs
- Foster practical skills and perfect professional qualifications
- Develop strong ties between scholarship and business
- Develop a cycle of improved innovation in the construction industry

The Concept of Center Strategy



- Develop and maintain close science and industry relationships, contributing to the development of BIM methodology and its practical implementation in the construction, transport, infrastructure, real estate, facility maintenance sectors, providing support to the public and private bodies, creating the digital society;
- Purposefully absorb technological innovations in construction engineering and consistently incorporate them into the study process, adapt them to curricula, implemented them to applied research areas and ongoing projects
- Integrate BIM technics and technologies into the curricula for the existing undergraduate and graduate studies in architectural, engineering and infrastructure engineering disciplines;
- Develop research and prepare professionals according to international requirements that meet BIM specialty models;
- Develop BIM education, vocational training and retraining programs that integrate into existing vocational education systems, carry out continuing professional training and qualification development of market professionals
- Develop national BIM documents - standards, requirements, manuals, and to participate in shaping the legal and institutional framework of digital construction together with governmental and state institutions and authorized representatives of the construction industry;
- Develop international cooperation with BIM scientific and research centers, laboratories, universities;

Digital Twin of the Built Environment

Other Information Resources

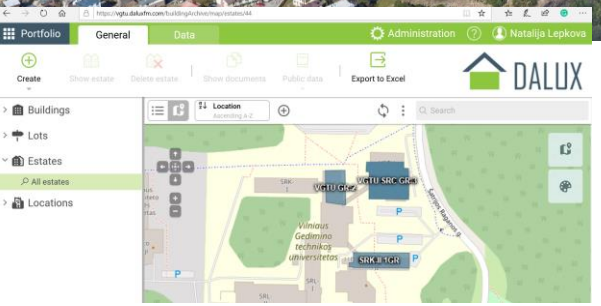
National Digital Twin

Other Industries

Smart Cities GIS+BIM

Digital Twin of the Built Environment

Smart Infrastructure PLM+BIM



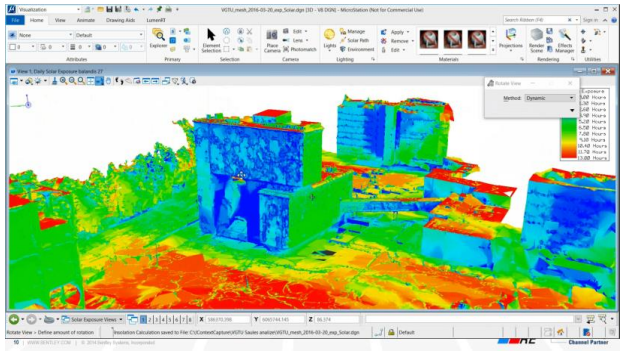
Digital Twin for the Asset Control

Digital Twin for the Asset Maintenance

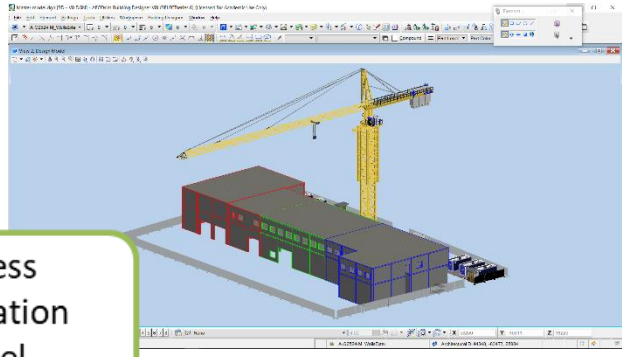
Digital Twin of the Facility

Digital Twin for the Asset Management

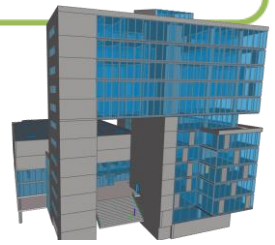
Digital Twin for the Asset Operations



Asset Information Model (AIM)



Analysis Information Model

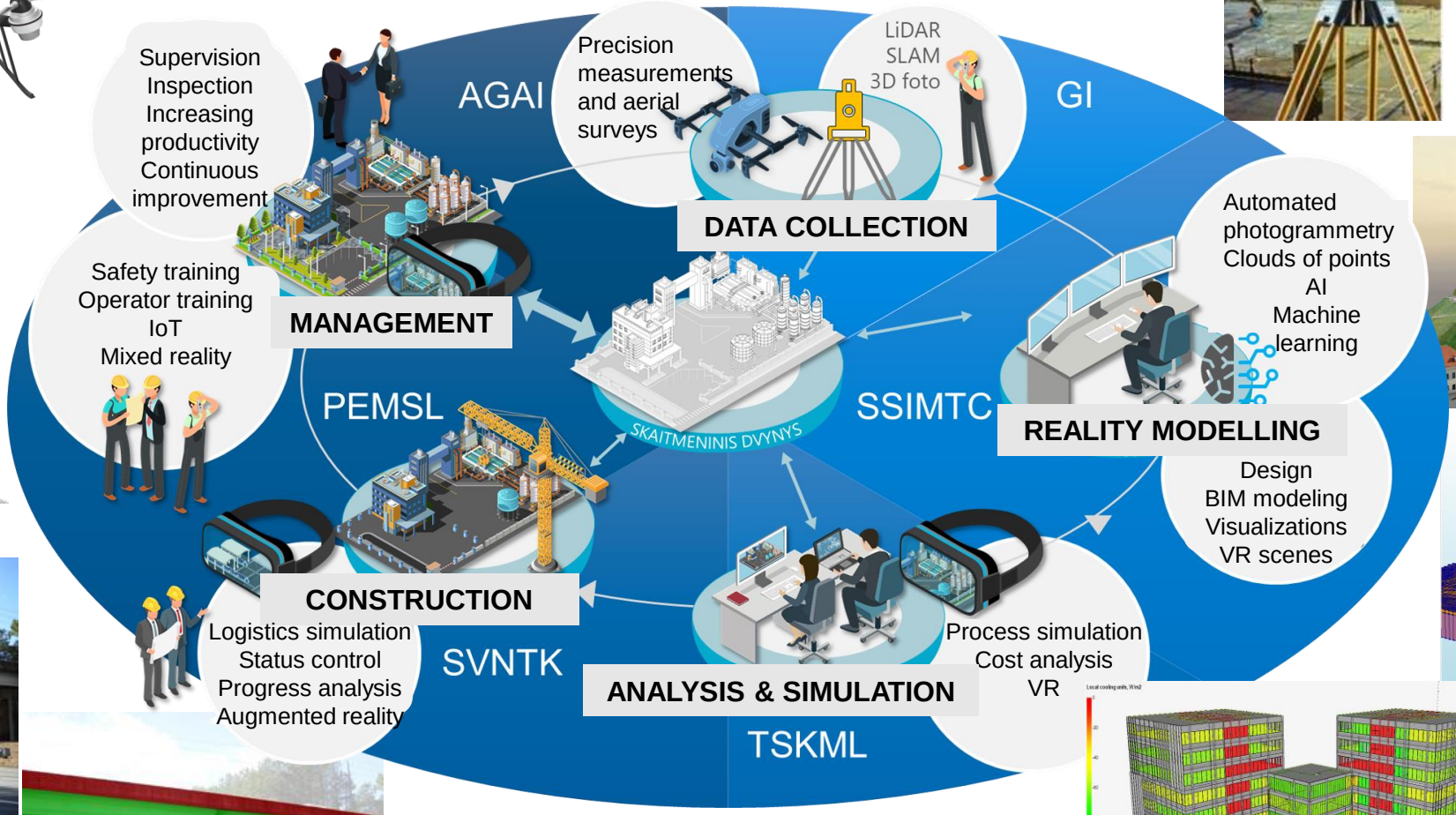


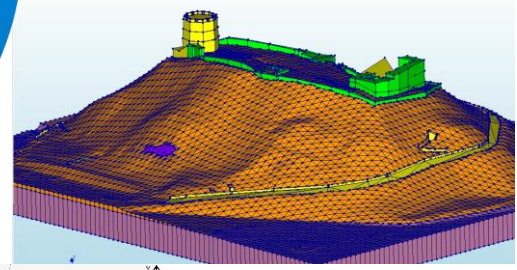
Object Information Model

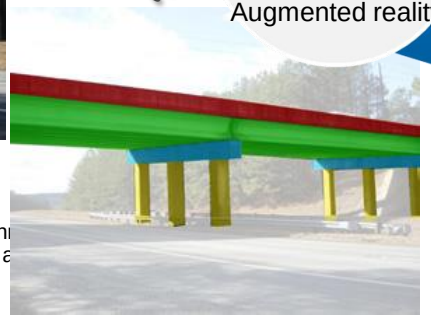
Process Information Model

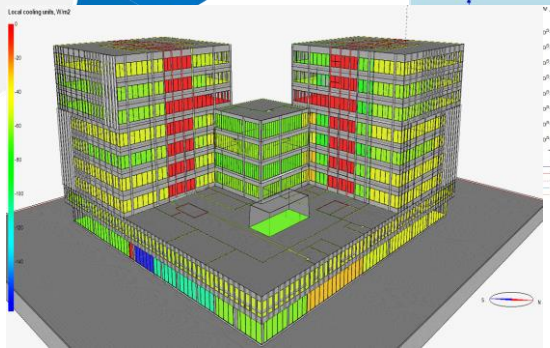
Project Information Model (PIM)

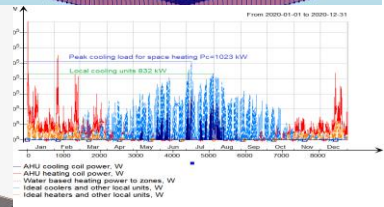
Reality Modelling, BIM, GIS and VR Integration Services at VILNIUS TECH





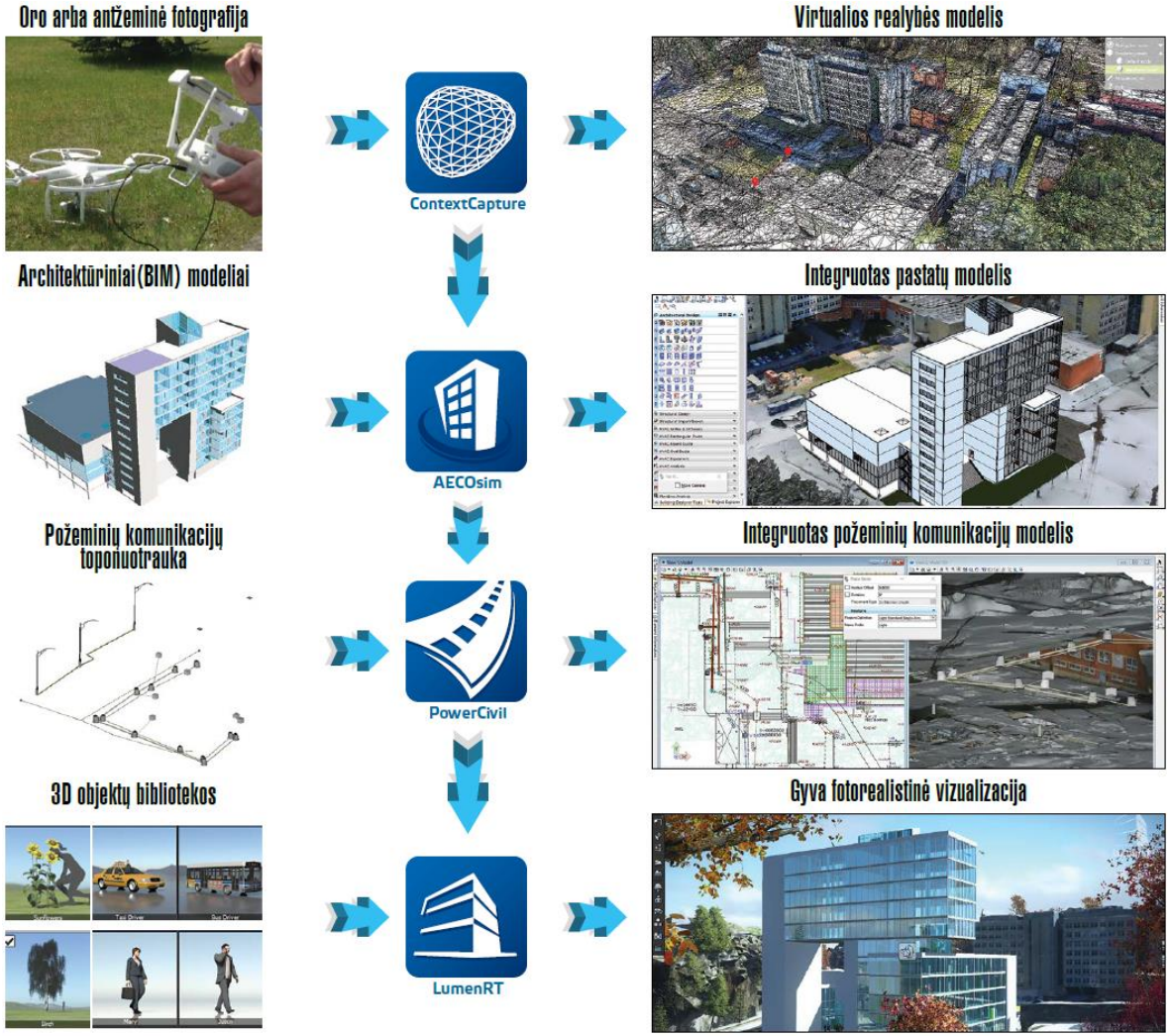




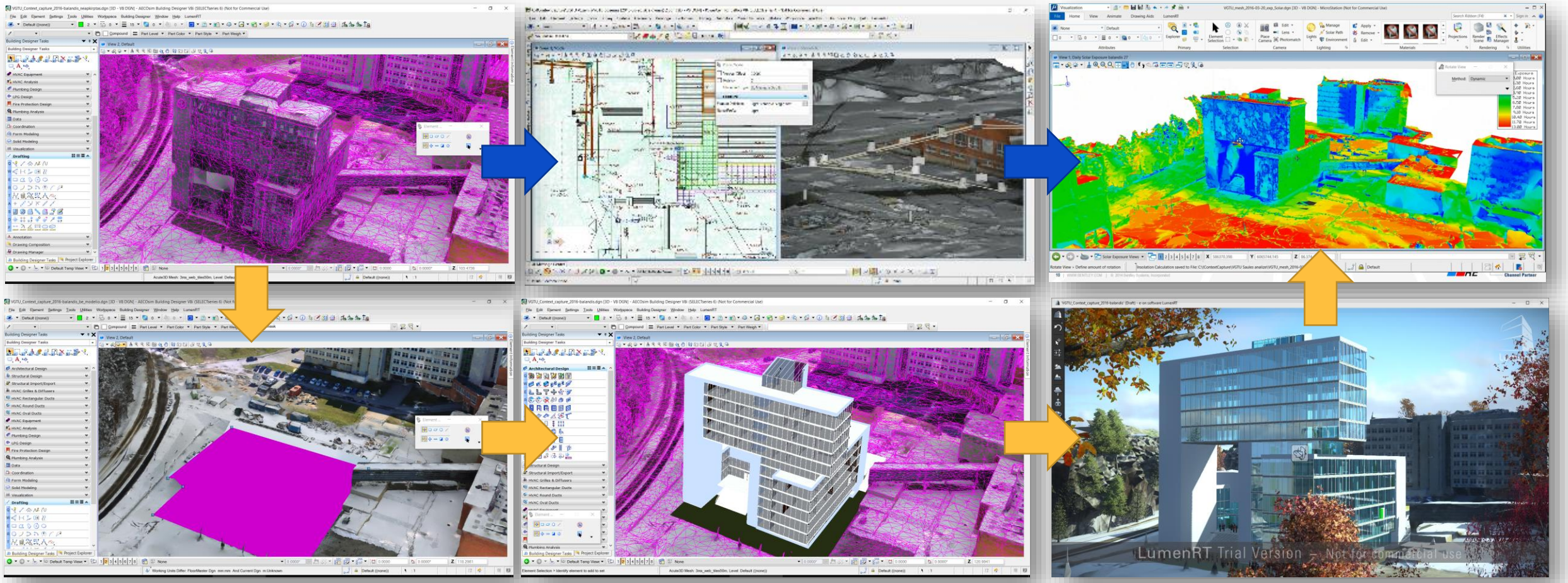


A Prototype of Smart City
Pilot Project with VILNIUS TECH – Spring 2016

- Participants
  - VILNIUS TECH Technology Centre for Building Information and Digital Modeling
  - VILNIUS TECH Department of Geodesy
  - Space Science and Technology Institute
  - IN RE
- Results
  - Photogrammetric Reality Model - Spatial Platform for 3D City
  - Integration of BIM Models with Reality Model
  - Reverse Engineering of 3D Underground Utilities
  - Photorealistic Live Visualization
  - A Model for 3D Printing



VILNIUS TECH Sauletekio Campus Digital Twin

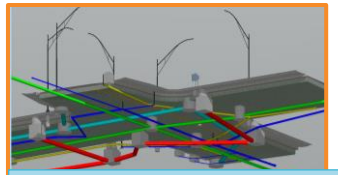


VILNIUS TECH Campus

https://eu.opencitiesplanner.bentley.com/vilniustech/sauletekis

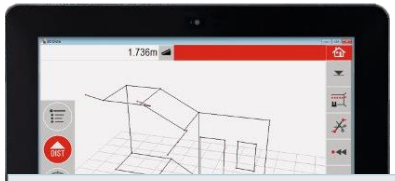
Concept of Preparation, Storage and Management of 3D Data of Real Estate

1.1. Creation of over-ground 3D data of Real Estate Cadaster

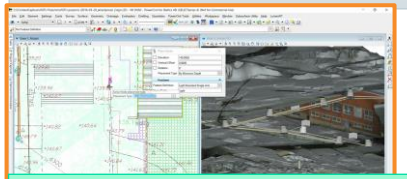


1.2. Creation of under-ground 3D data of Real Estate Cadaster

1.4. Automated processing technology for laser scanning and aerial photo data

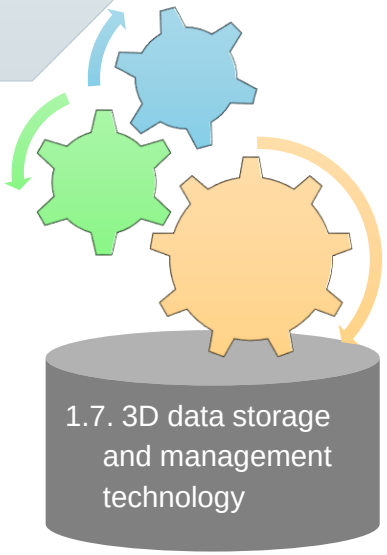


1.6. Technology to make a new measurements of Real Estate Cadaster object in 3D, and/or automated reconstruction of 3D from 2D drawings



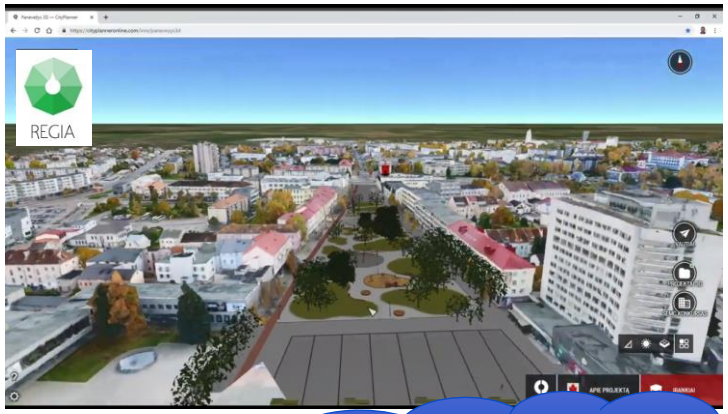
1.3. Integration of digital terrain models with Real Estate Cadaster 3D models

1.5. Integration of other important cadasters and registers spatial data (BIM models)



1.7. 3D data storage and management technology

1.8. Dynamic representation of the history of spatial data changes



2. Publishing of 3D models over Internet using REGIA system

The Prototype of RC

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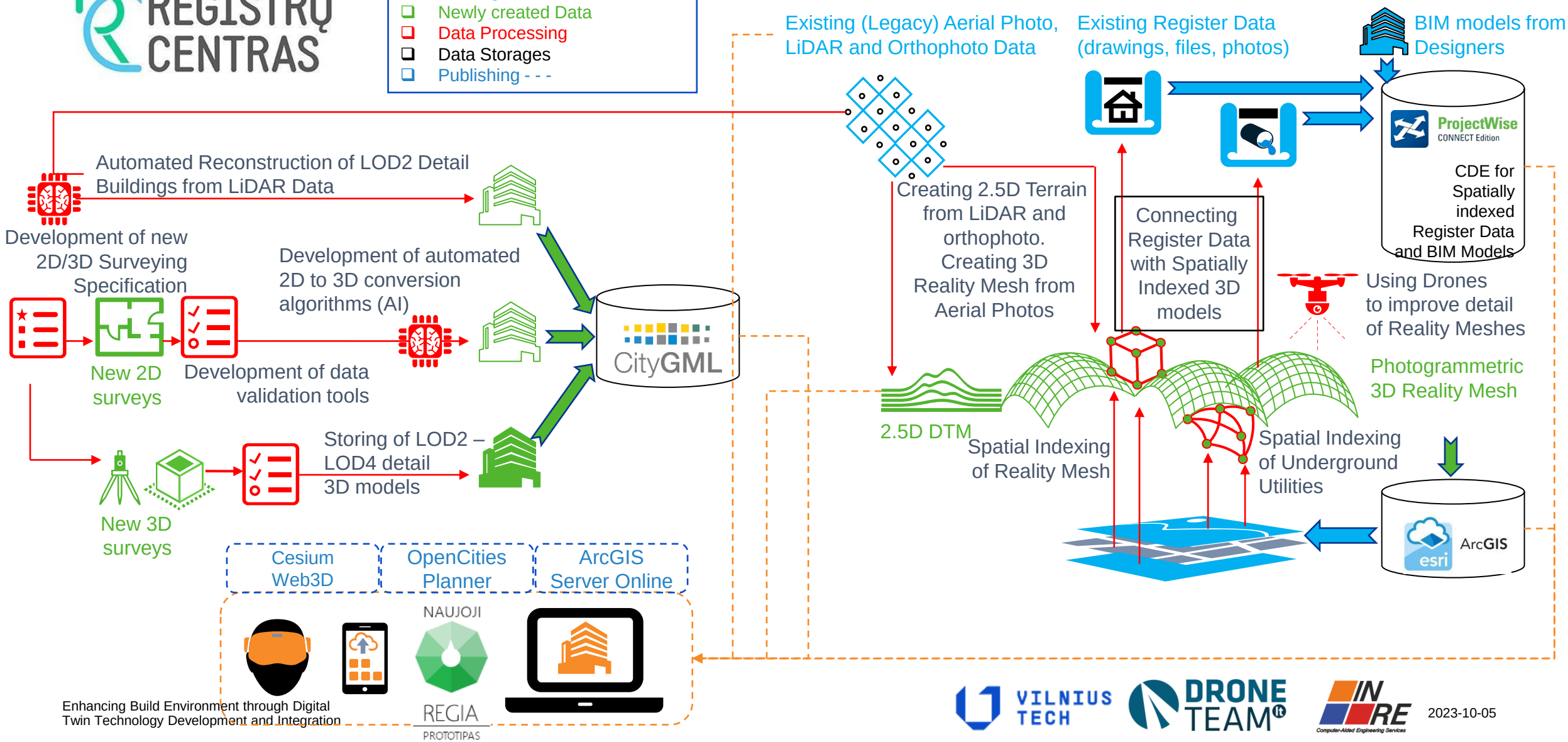
REGISTRŲ CENTRAS

- Existing Data
- Newly created Data
- Data Processing
- Data Storages
- Publishing - - -



Enhancing Build Environment through Digital Twin Technology Development and Integration

VILNIUS TECH DRONE TEAM INRE

2023-10-05

Power Line Inspection

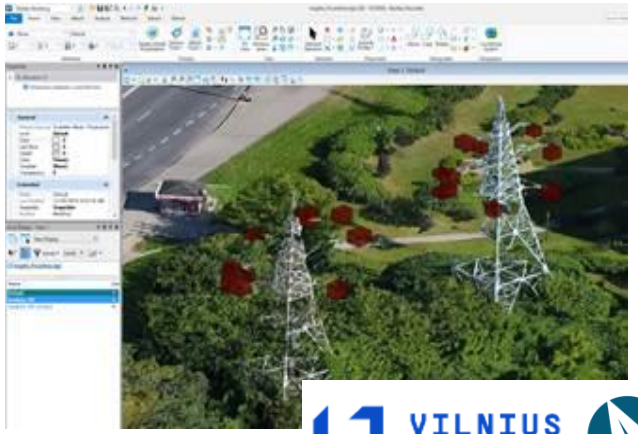
Photogrammetry, Machine Learning and AI

VILNIUS TECH

eso

Development of automated technologies designed for overhead power line diagnostics and detection of failures – defects

- The main goal – automatically detect insulators on power lines to ease a global defect assessment process on electrical network.
- A consistent dataset has been labeled and submitted for training.
- Insulators are viewed under different angles and each of them is tagged in the labeled photos.

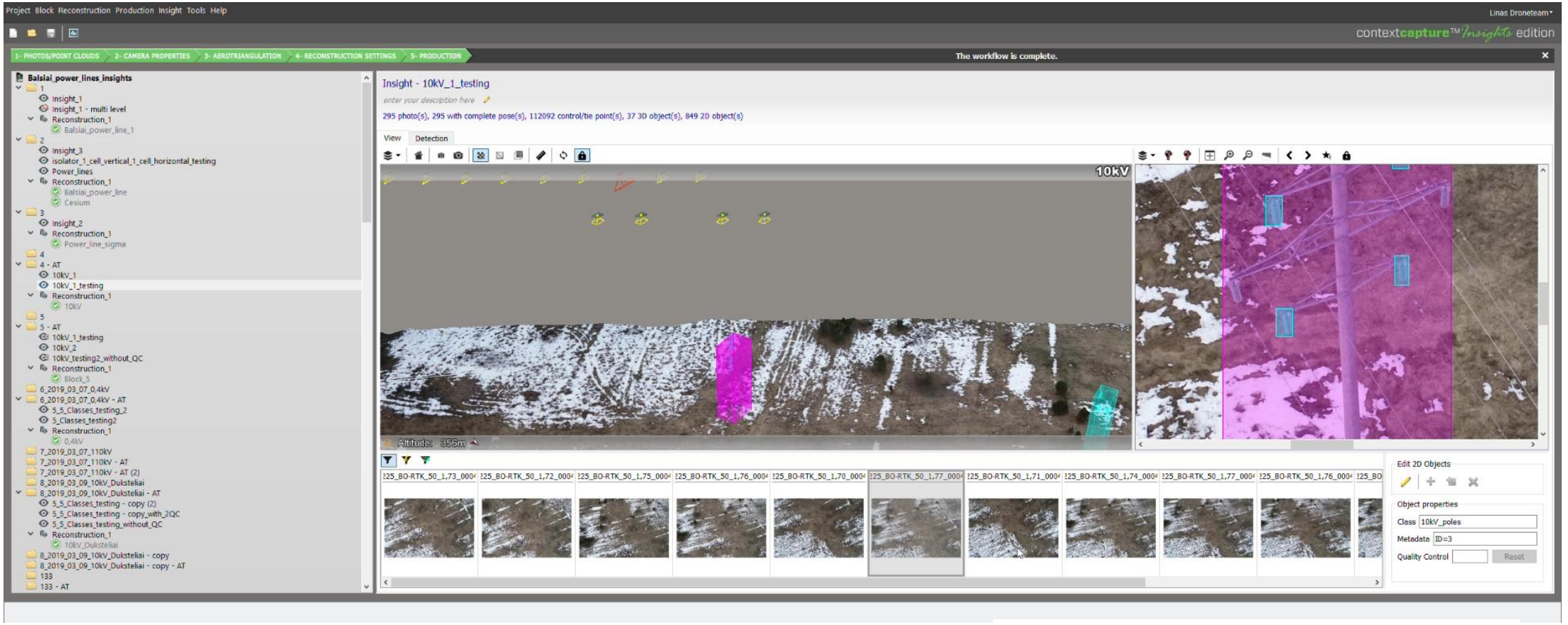


Some metrics:

Number of labeled images	190
Number of tags	805
Detector creation time	8h15

Power Line Inspection
Photogrammetry, Machine Learning and AI

- After detector creation, it is used on a traditional Reality Modeling scene.
- Even though some false are detected, most of insulators are automatically identified.



Prototype of Sustainable Digital Twin

To Improve Building Energy Performance

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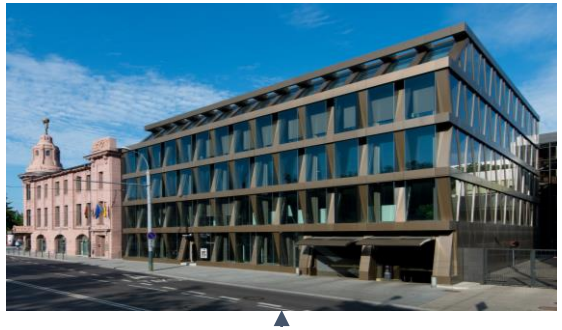
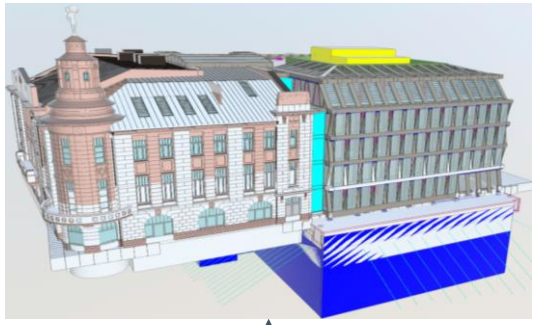
Planning | Design | Construction | Use



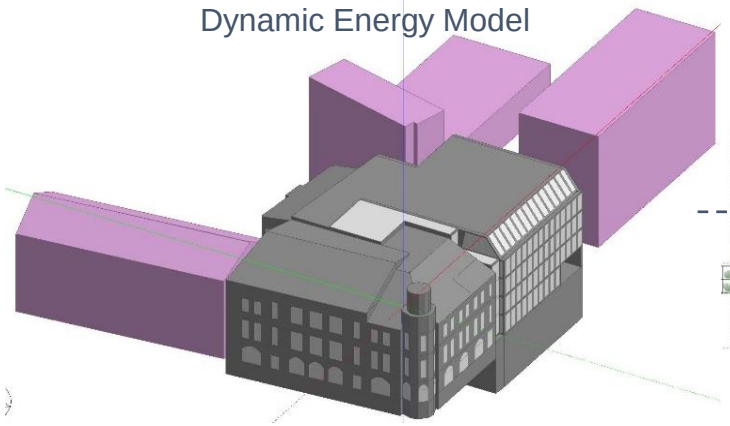


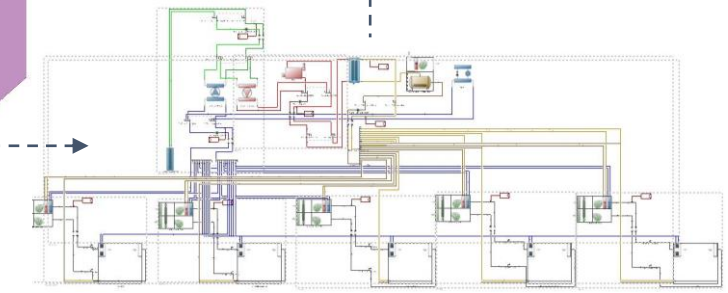
Enhanced Sustainable Design Solutions

Indication of Actual Energy Performance

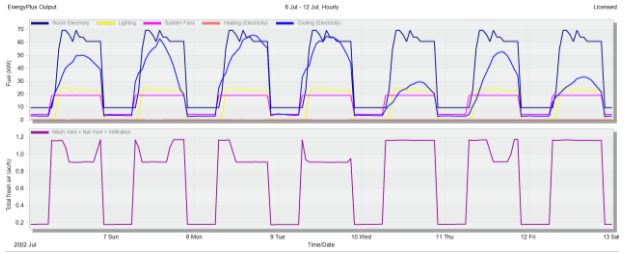
Improved energy performance by 20 %

Dynamic Energy Model





Integration of Enhanced New HVAC Control Algorithm



Our current scientific activities

Decision Support System of Well-being and Sustainability-oriented Digital Twin

for higher social accessibility and inclusiveness

Functional module integrated into the existing platform of Computerized Maintenance Management Systems (CMMS):

- uses Artificial Intelligence (AI) to process the IoT (smart meters, controllers and sensors) data
- combines Well-being and Sustainability Assessment,
- includes Decision Support System to improve the actual performance of the object.

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