BDTIC
2ND BUILDING DIGITAL TWIN International Congress

Syn.ikia digital twins towards reliable and trustworthy control

Wouter Borsboom, Ruud van der Linden, Behrouz Eslami Mossalam

26-5-2022

ORGANIZED BY:

BUILDING DIGITAL TWIN ASSOCIATION

SPHERE

syn.ikia

Appl.AI

TNO APPL.AI

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S H2020 PROGRAMME UNDER GRANT AGREEMENT NO. 820805.

Wouter Borsboom

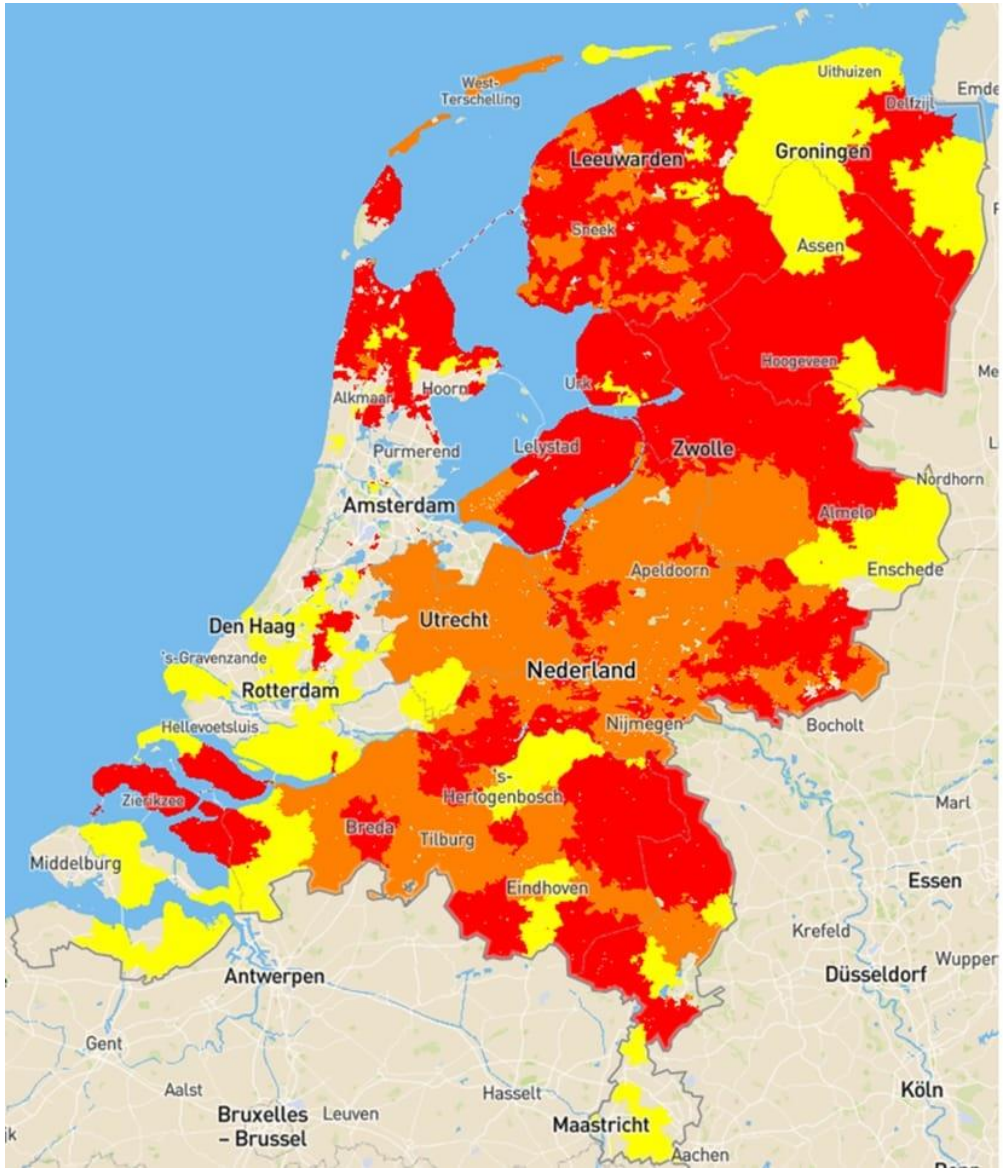
TNO (www.tno.nl) is an independent and not-for-profit organization. TNO connects people and knowledge to create innovations that boost the competitive strength of industry and the well-being of society in a sustainable way. This is our mission and it is what drives us, the over 3,400 professionals at TNO, in our work every day. We work in collaboration with partners and focus on nine domains.

Wouter Borsboom
Senior Business Consultant TNO

Energy Built Environment, Monitoring and assestment of dwellings and offices, energy, ventilation and health, Country representative IEA-ANNEX V: AIVC.org, Board Member INIVE.org, BDTA.

Towards Networks of predictive twins in the Built Environment, Arjen Adriaanse, Wouter Borsboom, Rob Roef, 2021
https://repository.tudelft.nl/islandora/object/uuid:ba8043dd-1dfc-4469-bfeb-53006de6e88a

Transport problems electricity Netherland

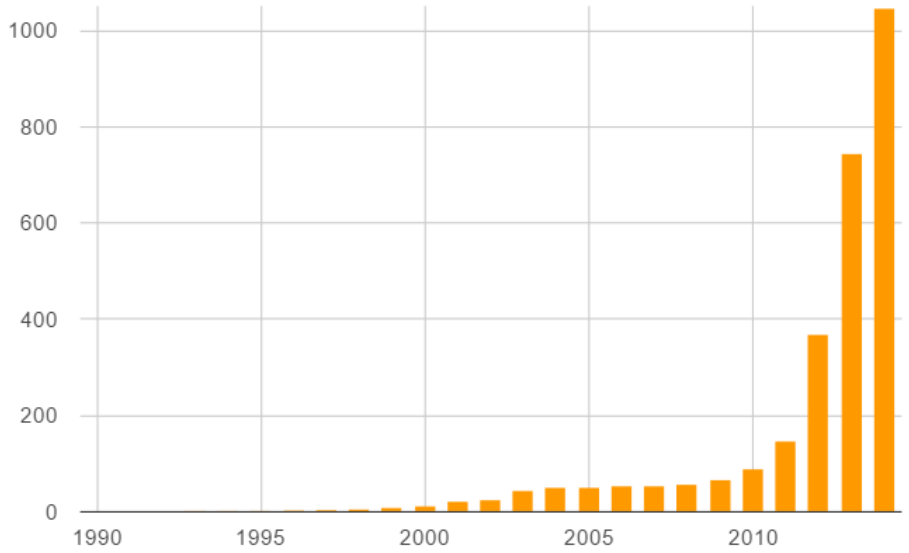


Yellow: transport capacity vailabity is limited

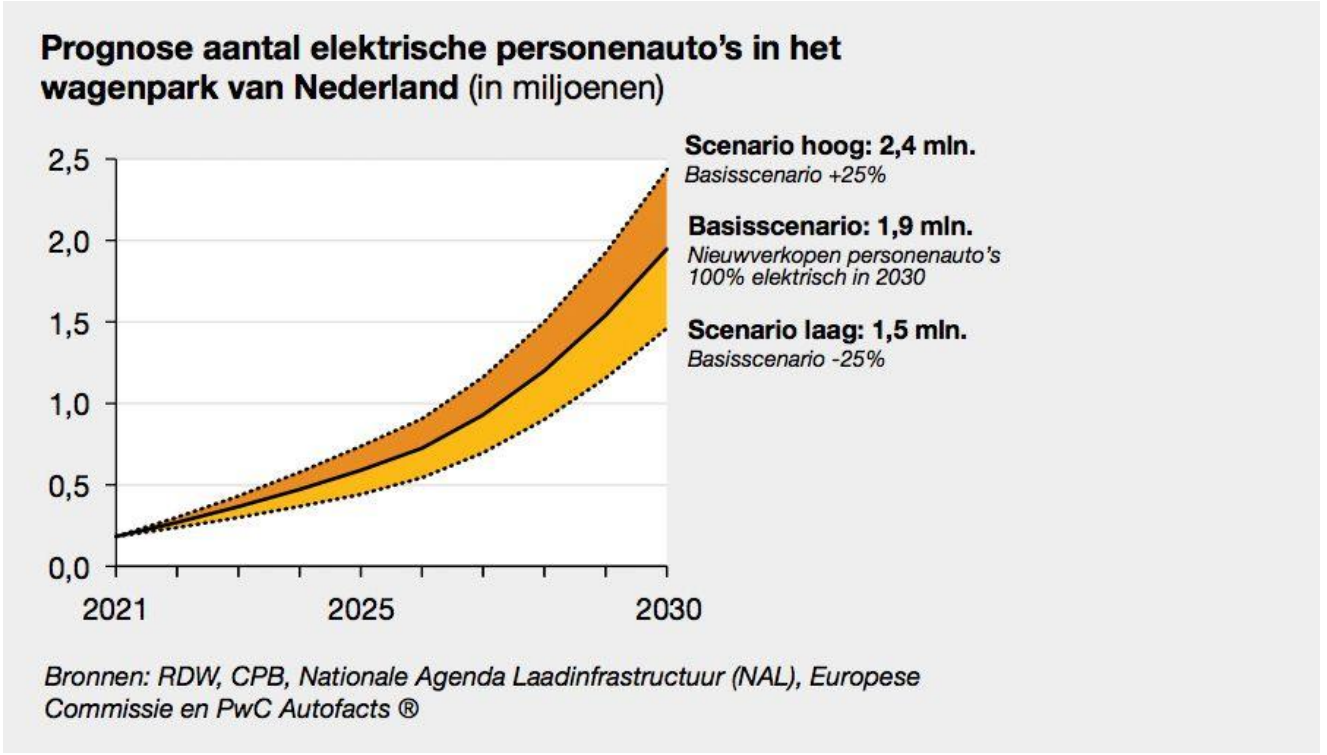
Orange: warning for structural congestion

Red: structual congestion, no new connection to the grid

Grow of solar, electrical vehicles, heat pumps..

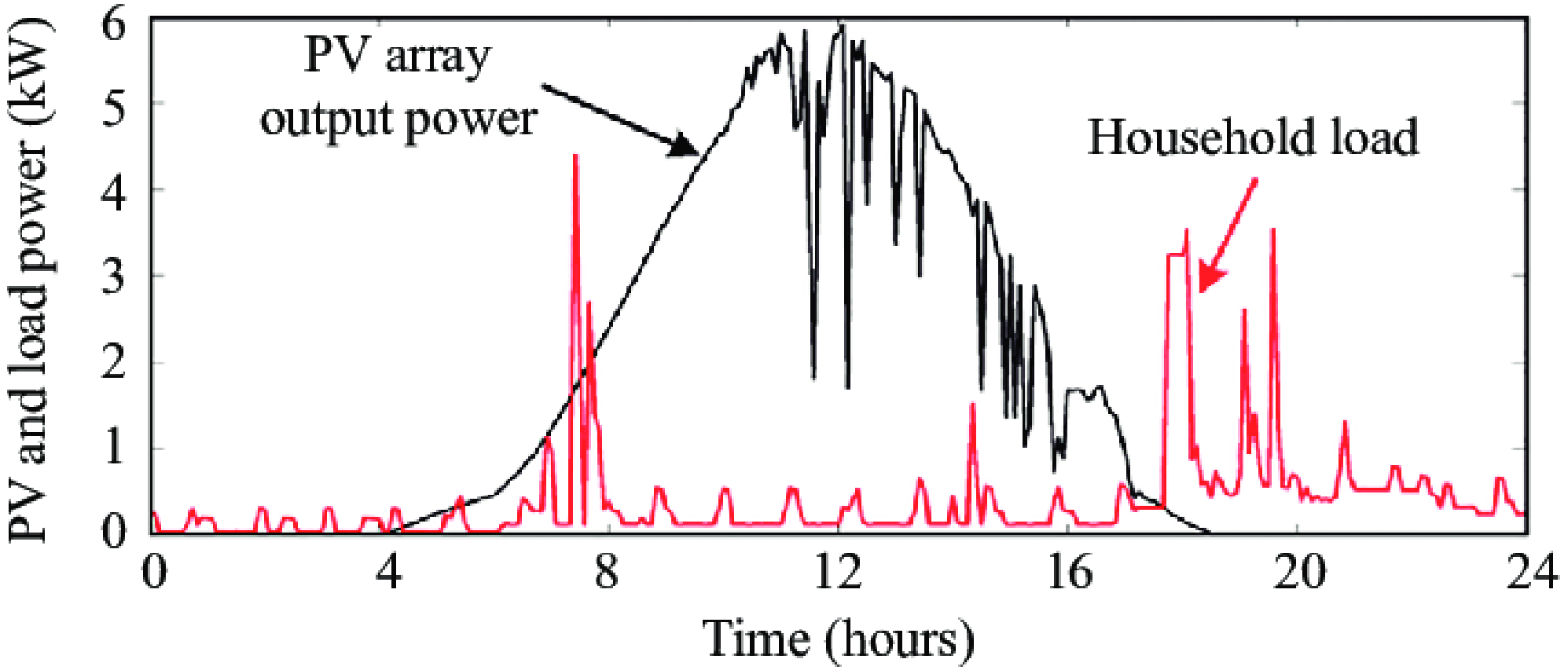


Number of solar panels



Different scenario's of electric cars in Netherland

Demand of electricity and supply of PV



Partners in syn.ikia

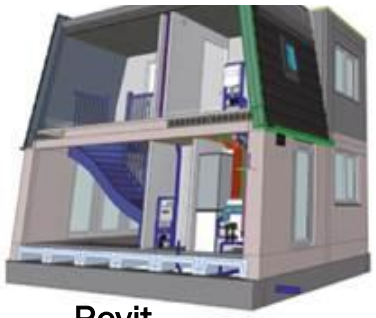
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 869918

syn.ikia

Digital twin Syn.ikia: Area apartment building

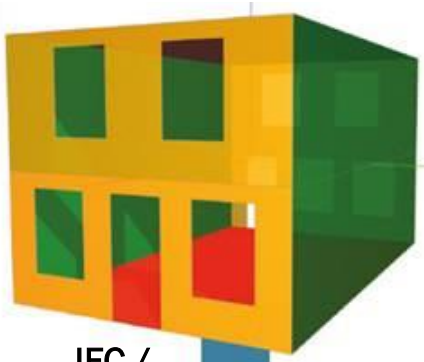
BIM-Information

Building Information Model (BIM)



Revit

Building Energy Model (BEM)



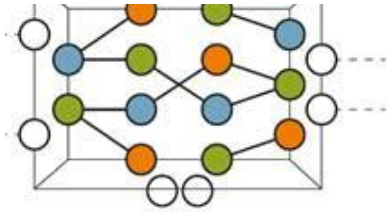
IFC / gbXML

TNO Sirin-E Predictive Twin

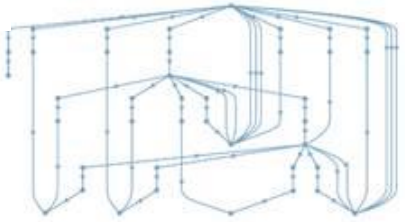
Dynamic data (measuring data)

HayStack

User behaviour model (data en machine learning, Federated learning))



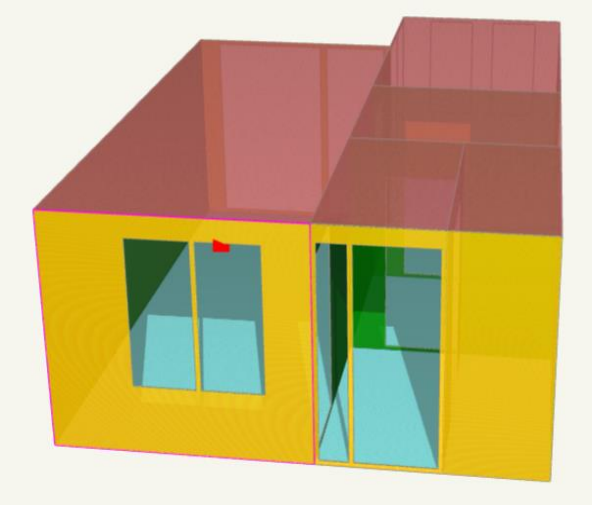
Physical model energy use



SirinE

Hybrid building model, analyze, predict, control

Use of BIM, example of gbXML data

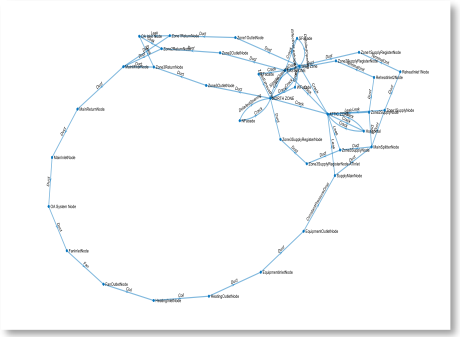


Uden gbXML apartment

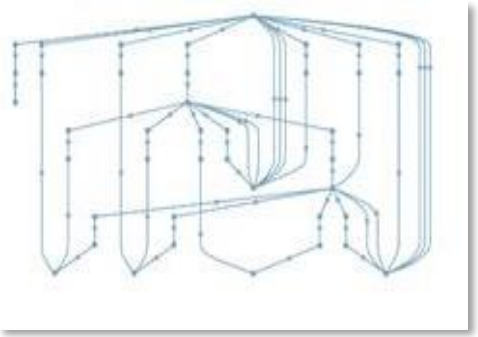
gbXML data container & **IDF** (Energy plus) for installations

File import / data selection

Generation of a general struct containing all information needed for building simulation

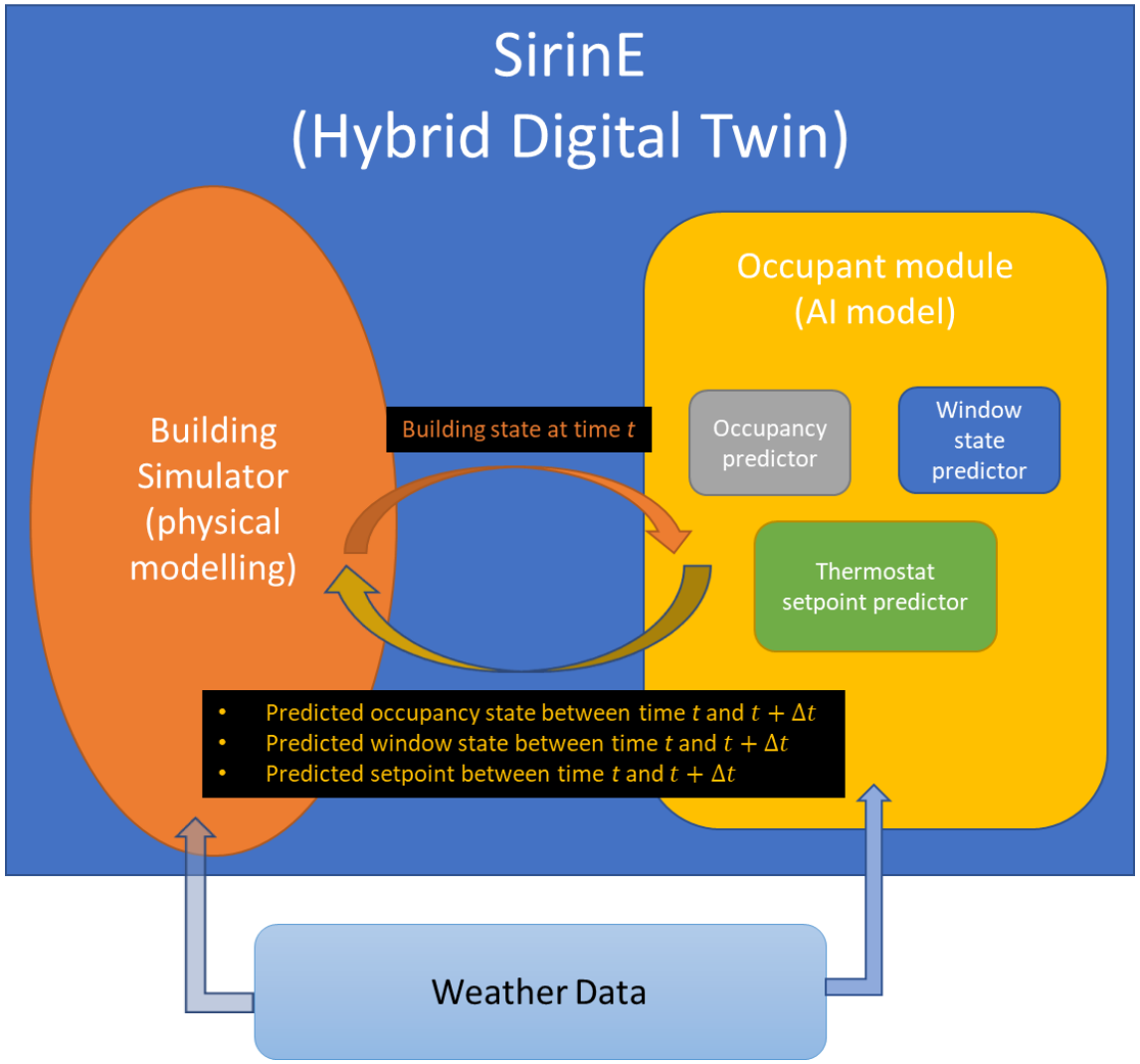


TNO AirMaps ventilation model



TNO Heat transfer model

Expansion hybrid model with AI user models



TNO Building Simulator

127.0.0.1:5000

TNO innovation for life

Dashboard

Menu

light streets dark satellite

Project Info | Simulation Settings

Project Name:

Project Info:

rotation | surface | surfaces | edges | all

Id:

Name:

surfaceType:

surfaceArea [m2]:

constructionIdRef:

AdjacentSpaceId:

Opening:

openingType:

U-value [W/m2K]:

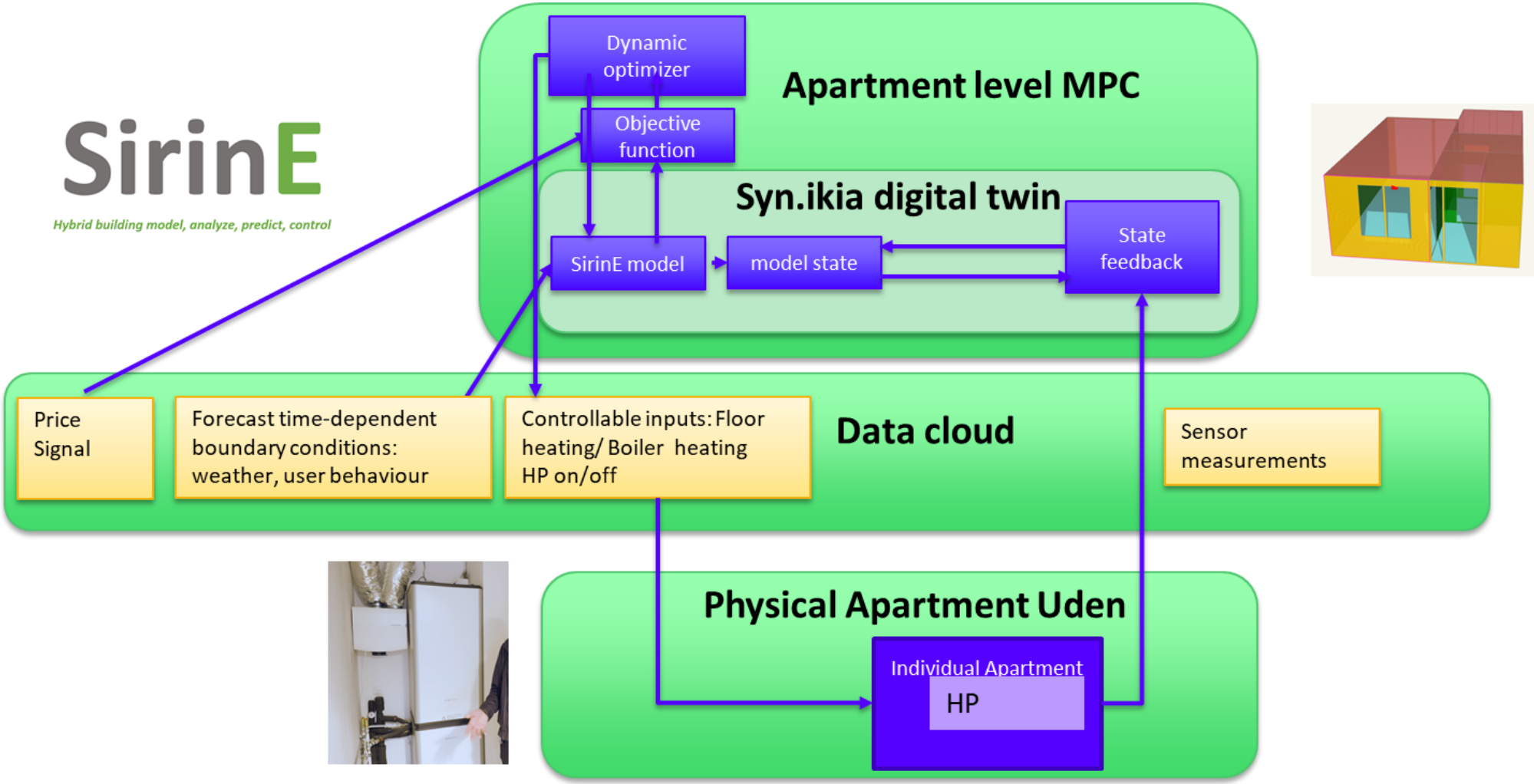
SolarHeatGainCoeff [fraction]:

13:20
22-3-2022

Apartement level MPC

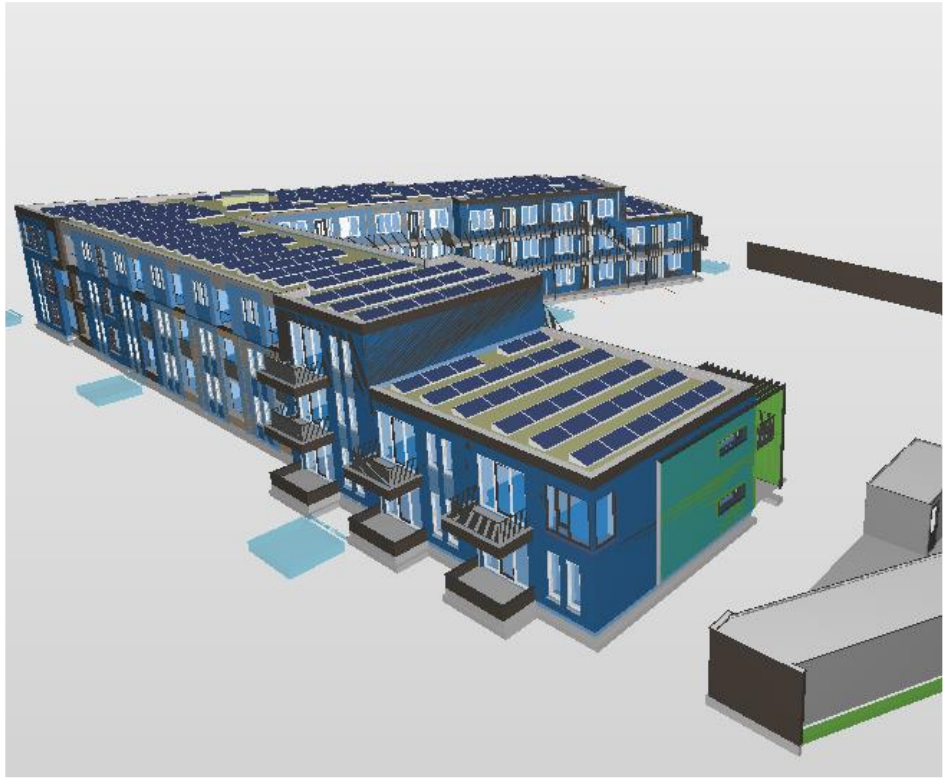
SirinE

Hybrid building model, analyze, predict, control



Challenges for MPC based on pricing

- How do we assure privacy of personal data
- Can we explain the outcomes of the model to the consultant
- Can we as a consultant trust the prediction of the model
- Do we no if this is fair for those occupants who can adapt or cannot adapt to this change in pricing?



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BIM DIGITAL TWIN ENVIRONMENT

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