*“Unleash the unconventional: from game engine to co-simulation platforms for building performance analyses”*

ARUP

# Index of the presentation

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    - Background
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    - Background
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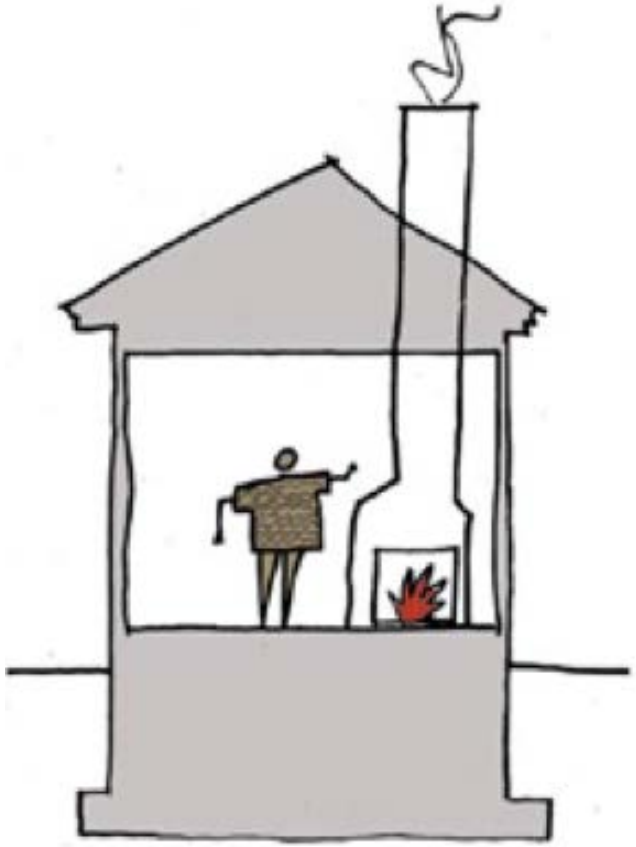
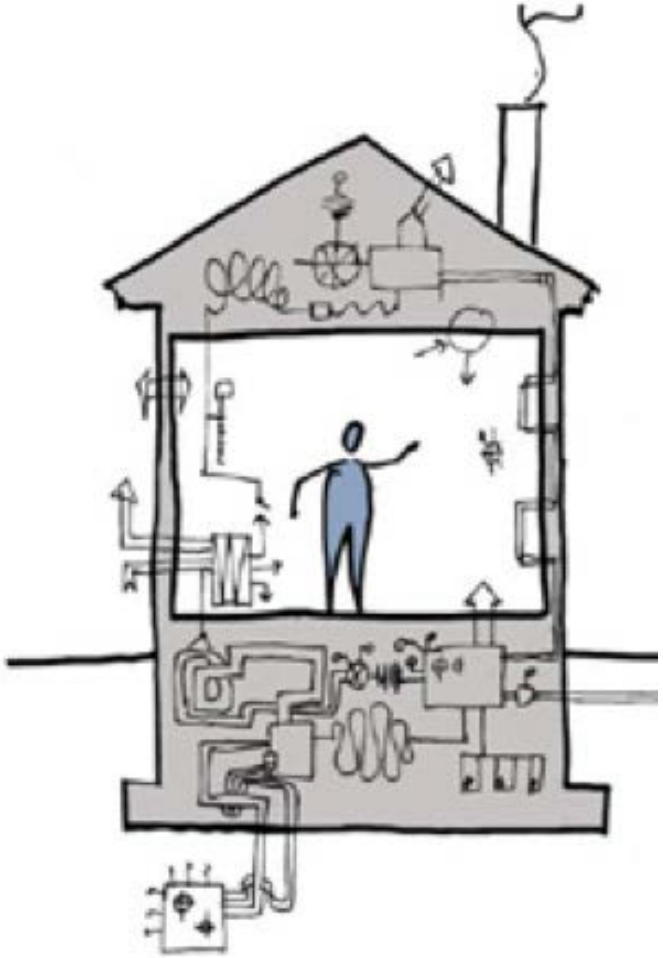
3. Q&A

unity

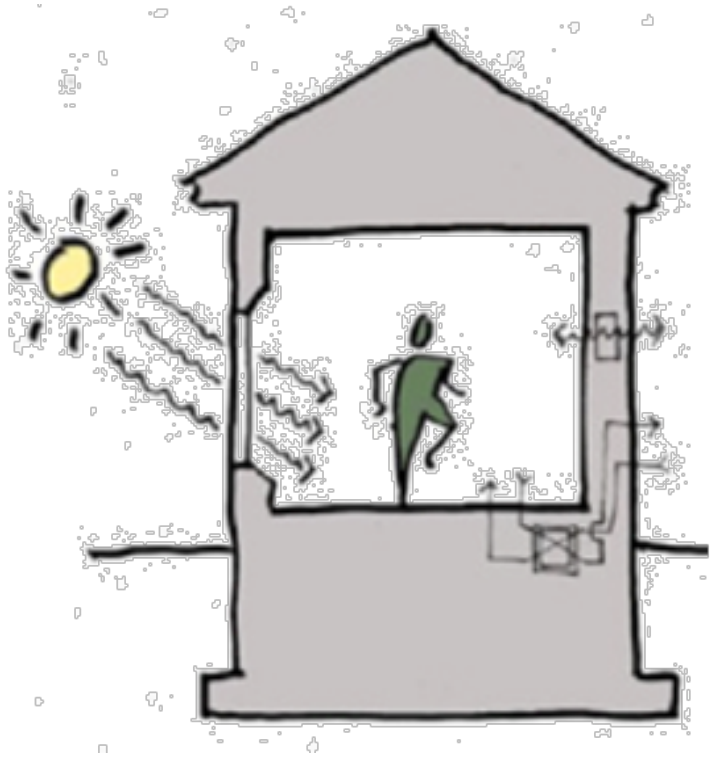
# Trend



19th century

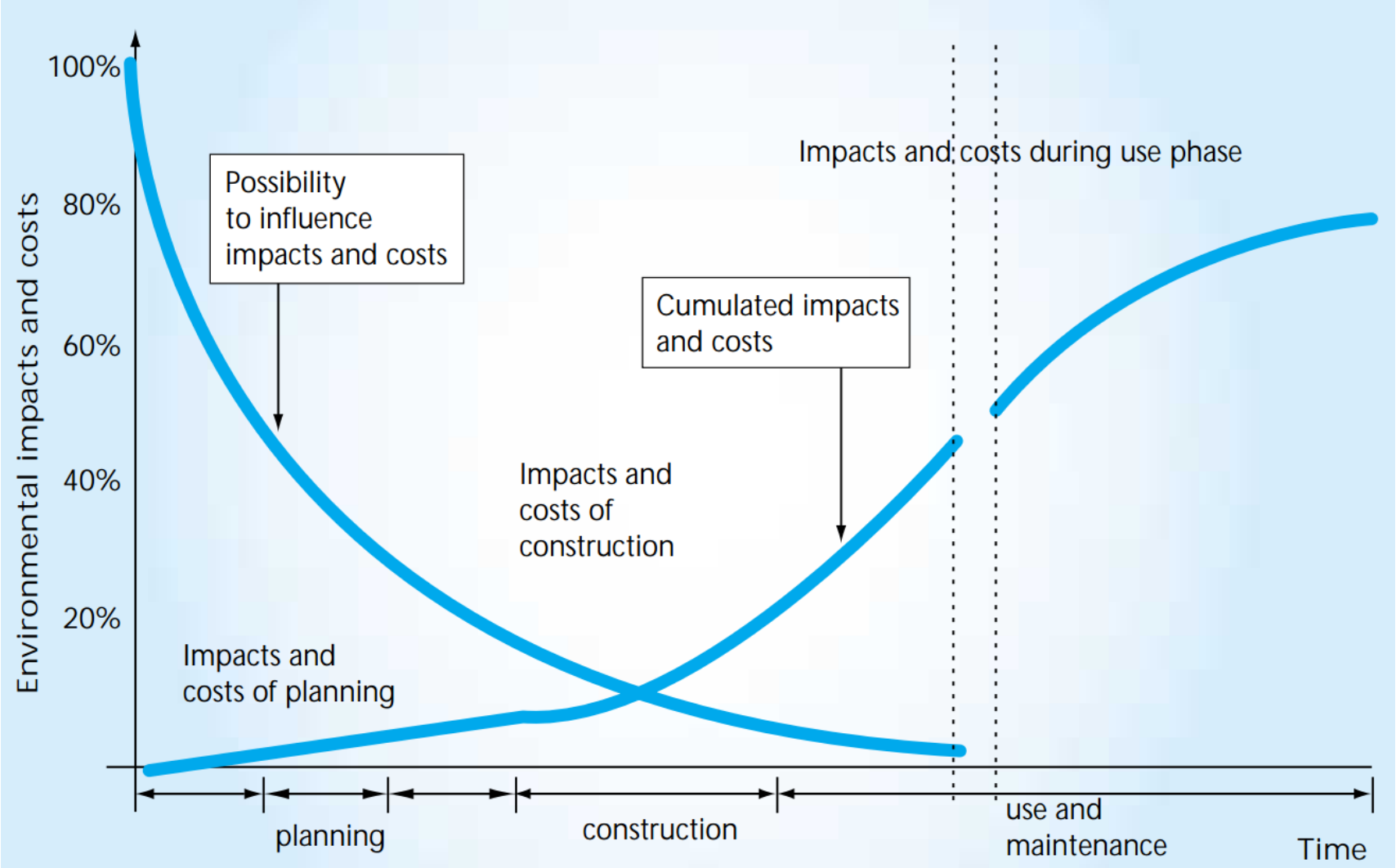


20th century



21th century

# Early stages




Kohler N. and Moffatt S. 2003

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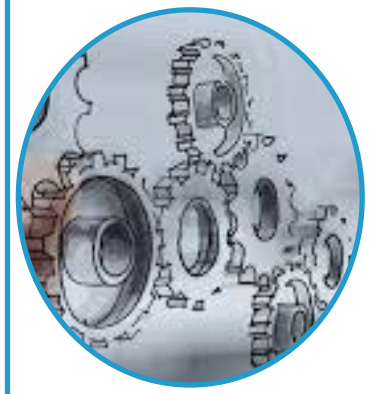
# Actors

Client

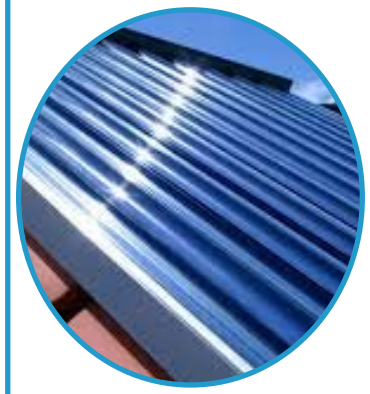
Architect

Façade Engineer



Mechanical Engineer

Electrical Engineer



Public Health Engineer

We recognize the importance of a multidisciplinary, holistic and informed design

# Tools

eQuest

IES-VE

Energy Plus

Ecotect

Sefaira

We did an extensive research about the software in the market

# Needs

Reliability

Flexibility

Clarity

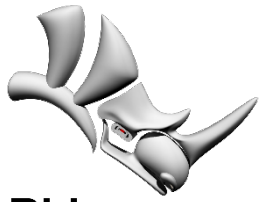
Visual Appealing

We identified a lack of suitable software for early design stages

# Towards the new application

STEP 1

BUILDING GEOMETRY



STEP 2

SOLAR ANALYSIS

C#

Dynamo

STEP 3

APP CREATION

unity

C#

STEP 4

RUN THE APP

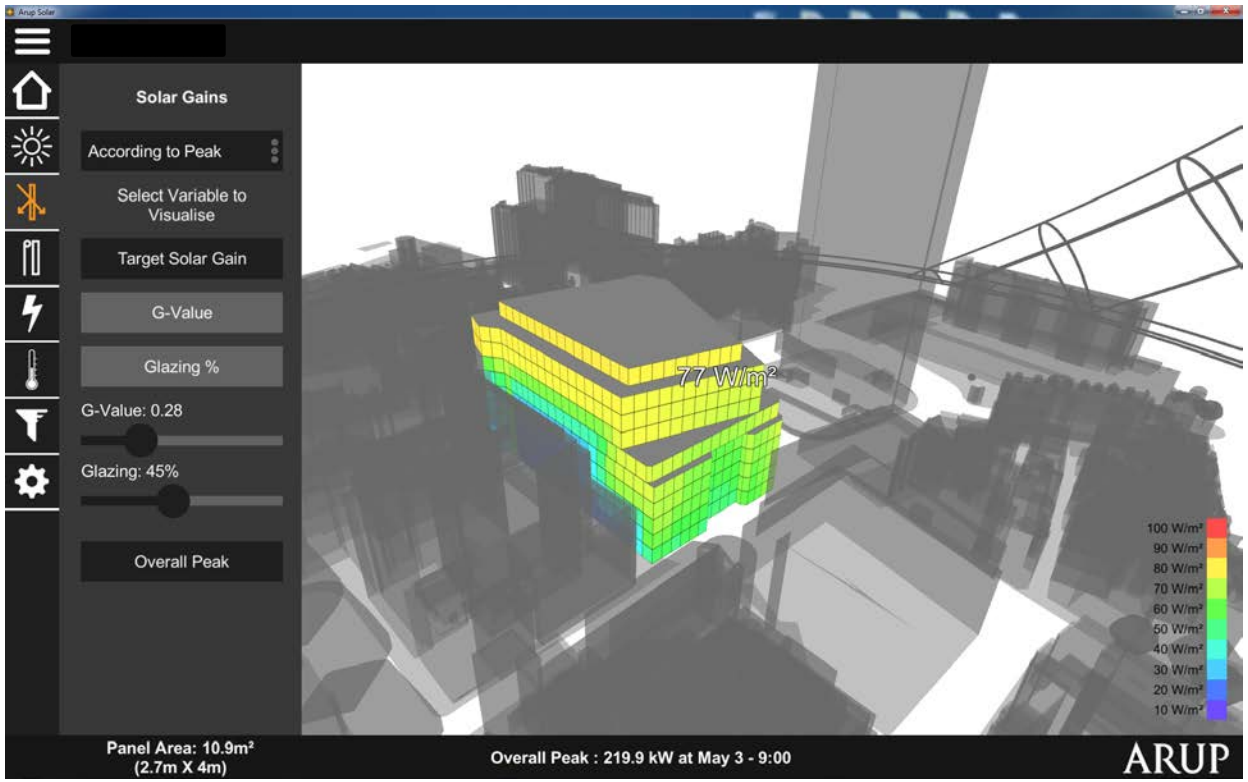
unity

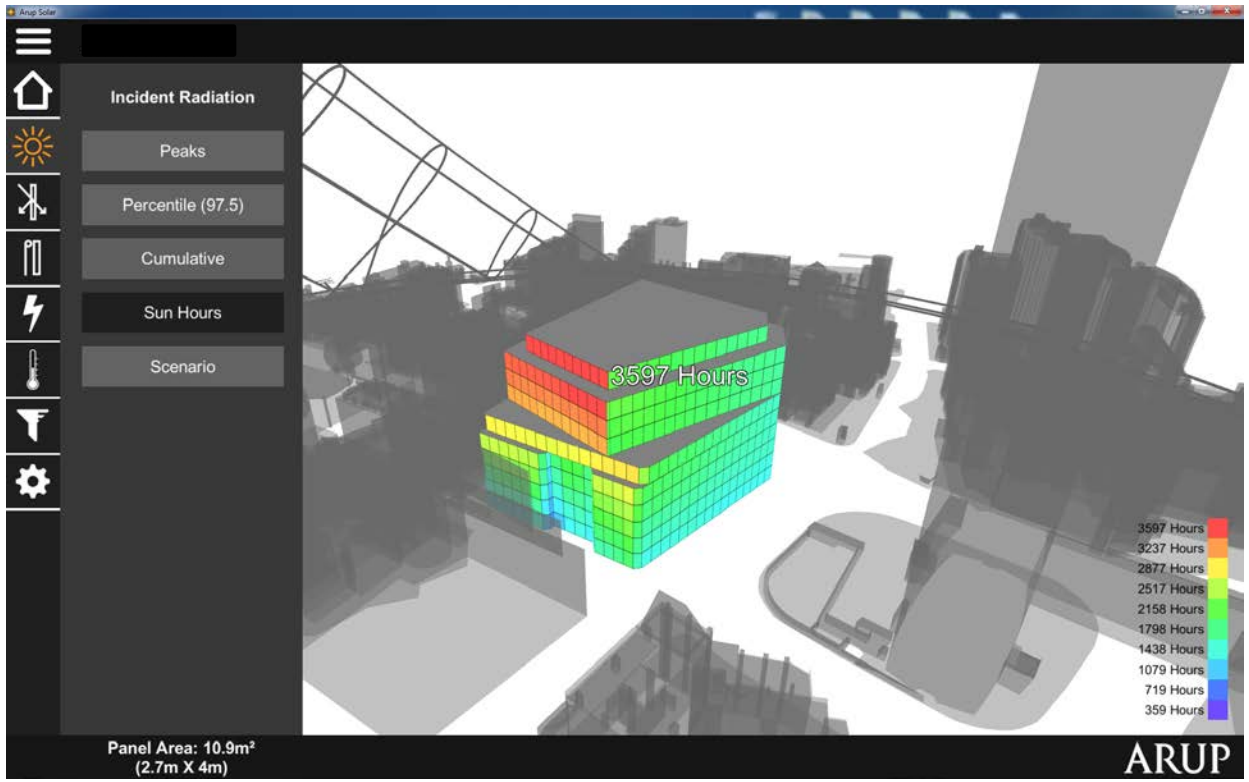
Workflow to build the APP

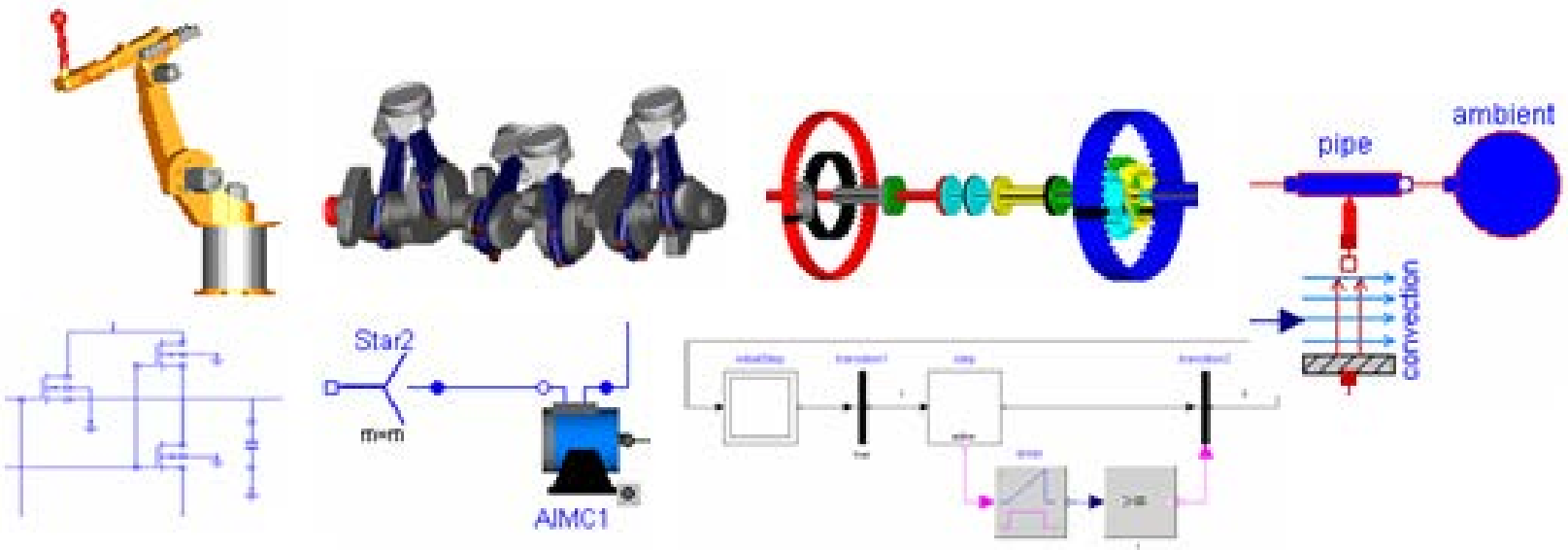
# Game engines for building services design

the APP

# Game engines for building services design






# DYMOLA Systems Engineering

## Multi-Engineering Modeling and Simulation based on Modelica and FMI

# Co-simulation platforms for building performance analyses

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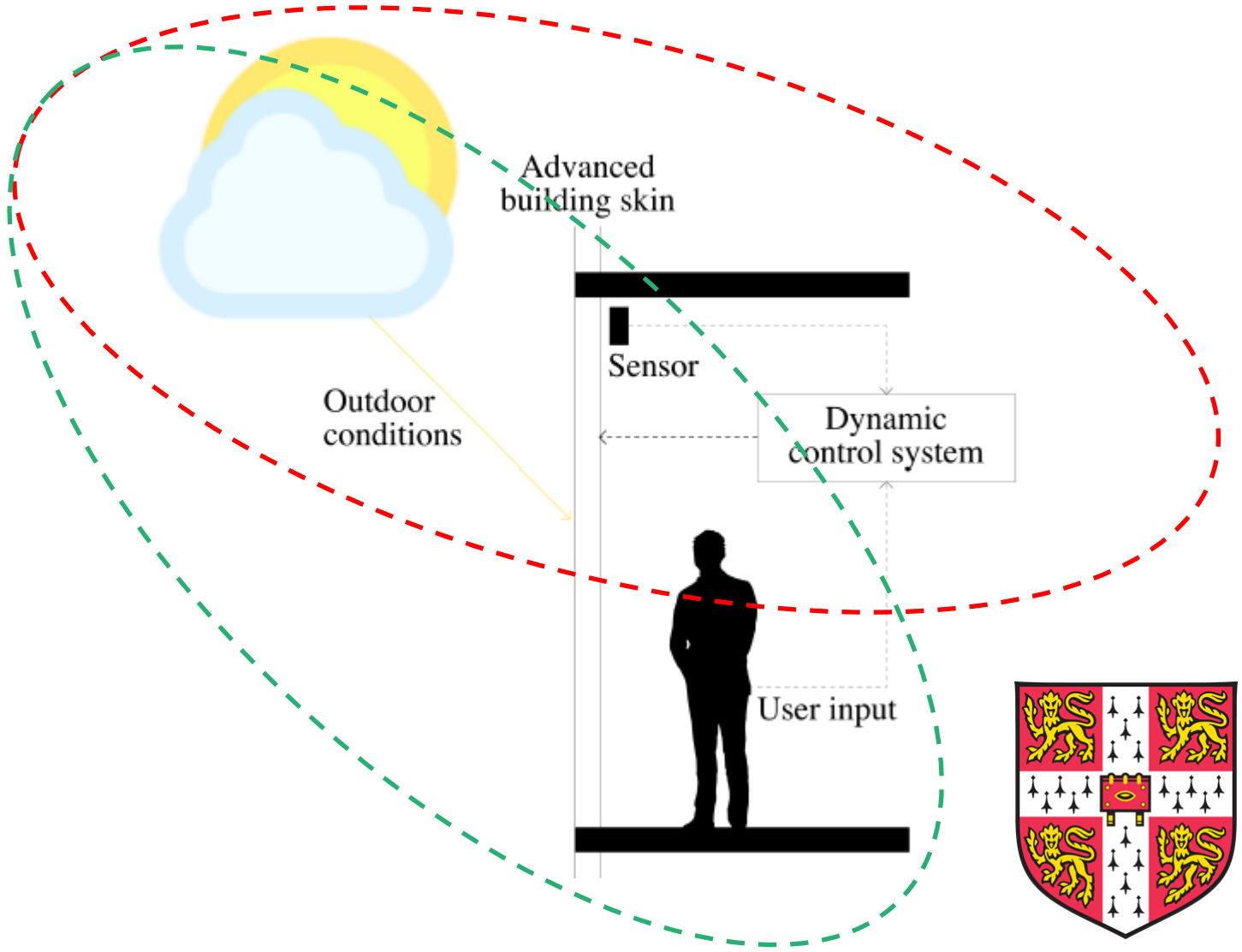
UCL

PhD student Esther Borkowski

# Co-simulation platforms for building performance analyses




UCL

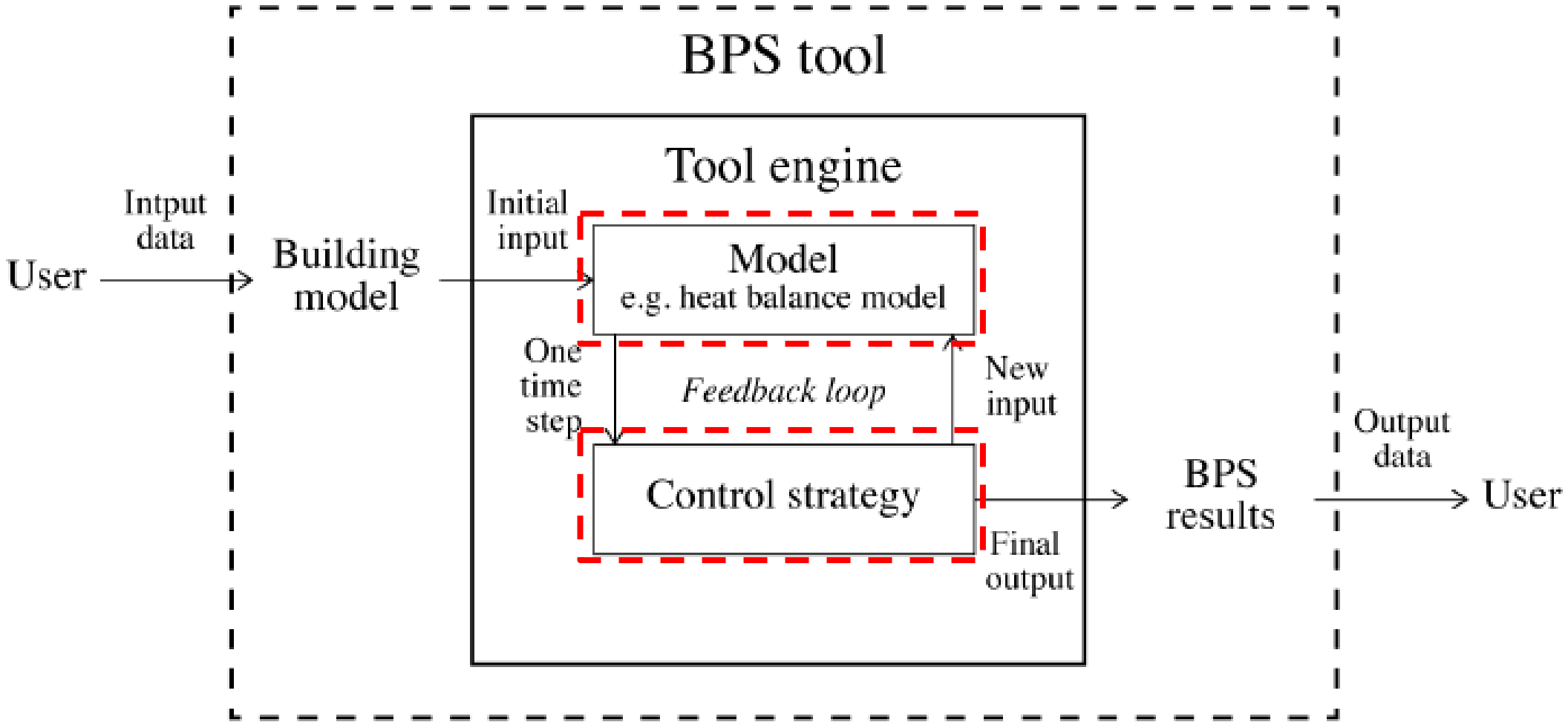
PERMASTEELISA
GROUP

# Co-simulation platforms for building performance analyses

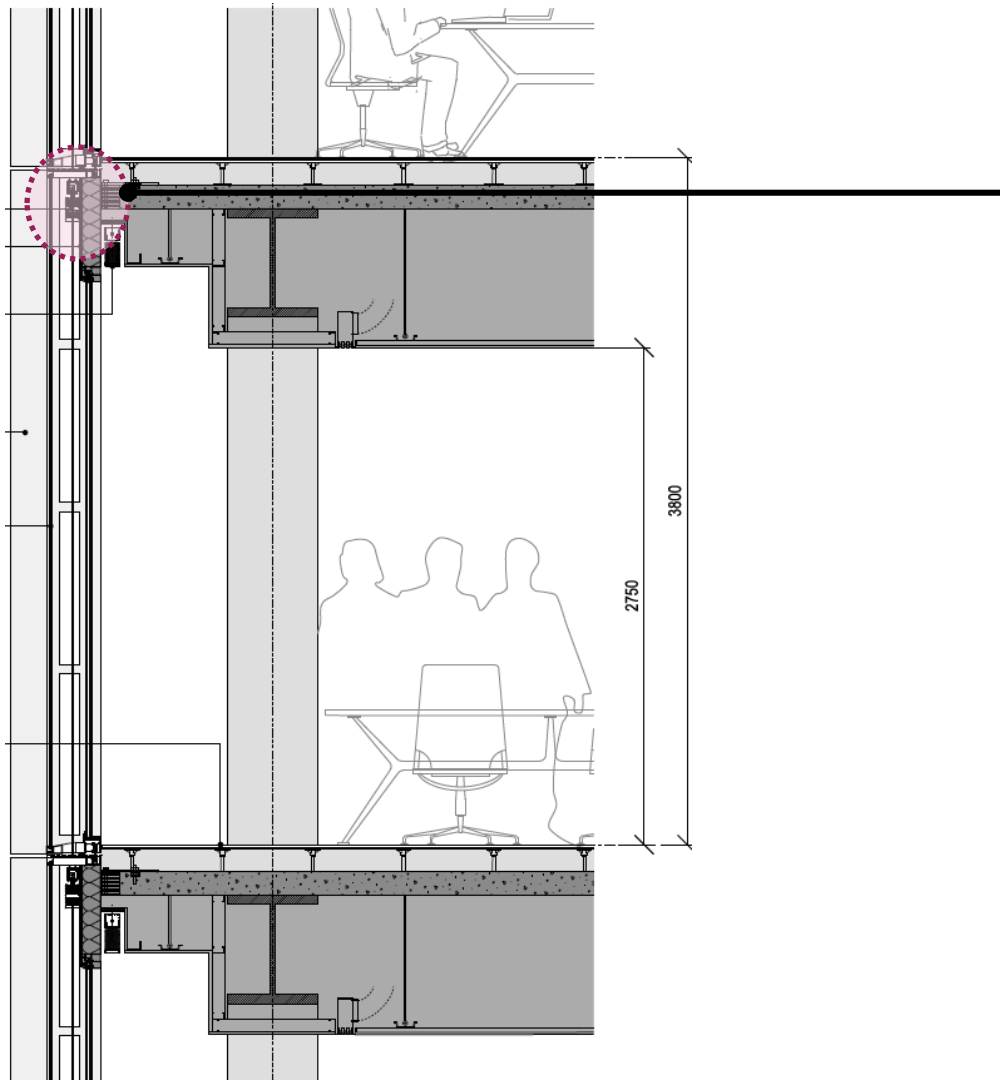
Why using them?

- **Decomposition of the design**, the design is decomposed into individual functional or logical components
- **Hierarchical modelling**, components may internally consist of other connected components
- **Component libraries**, ready-to-use equation-based model components from various application areas

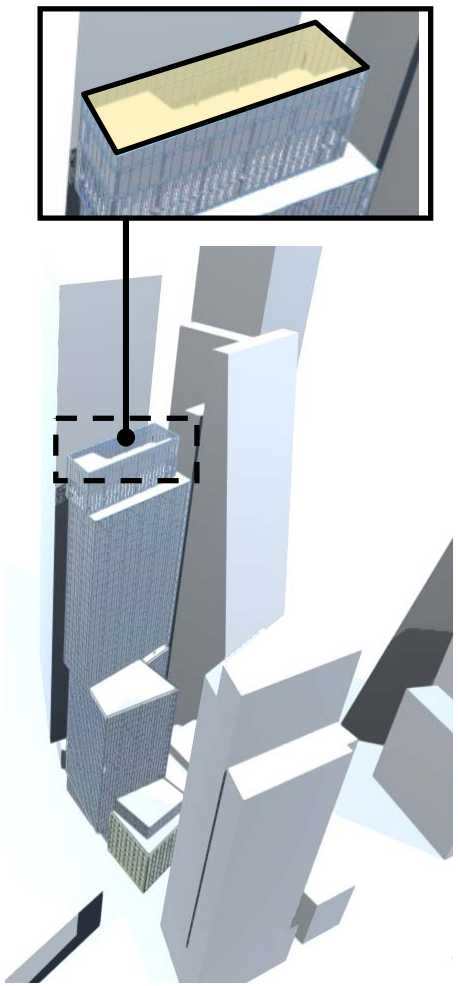
# Co-simulation platforms for building performance analyses



# Case study



# Control strategy



OPEN

HOR

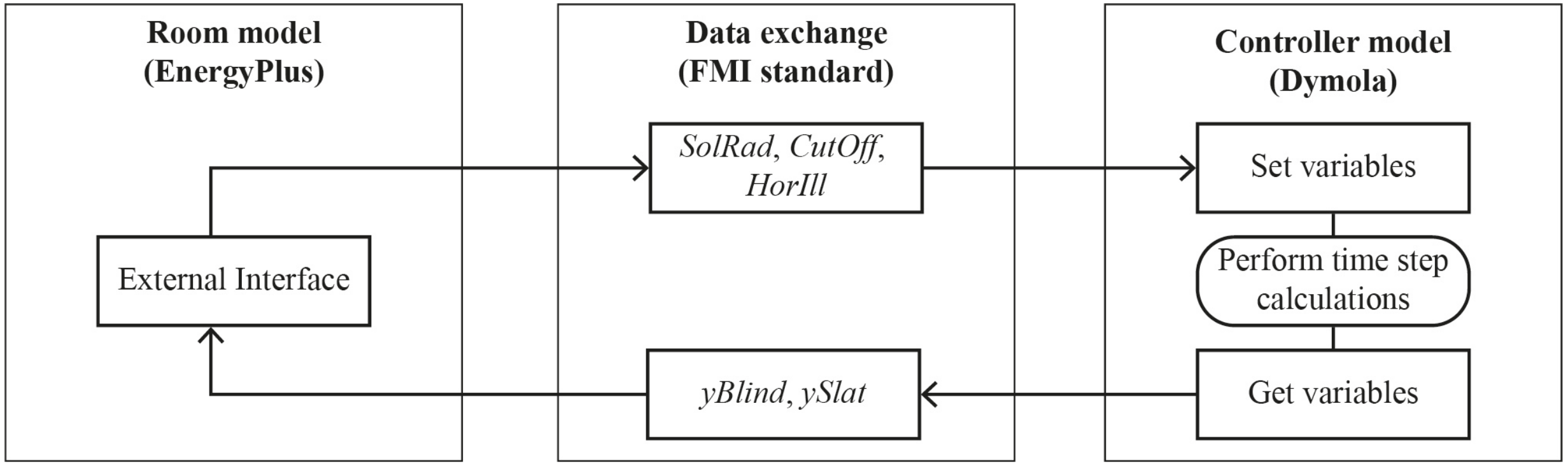
30°

45°

60°

90°

# Control strategy

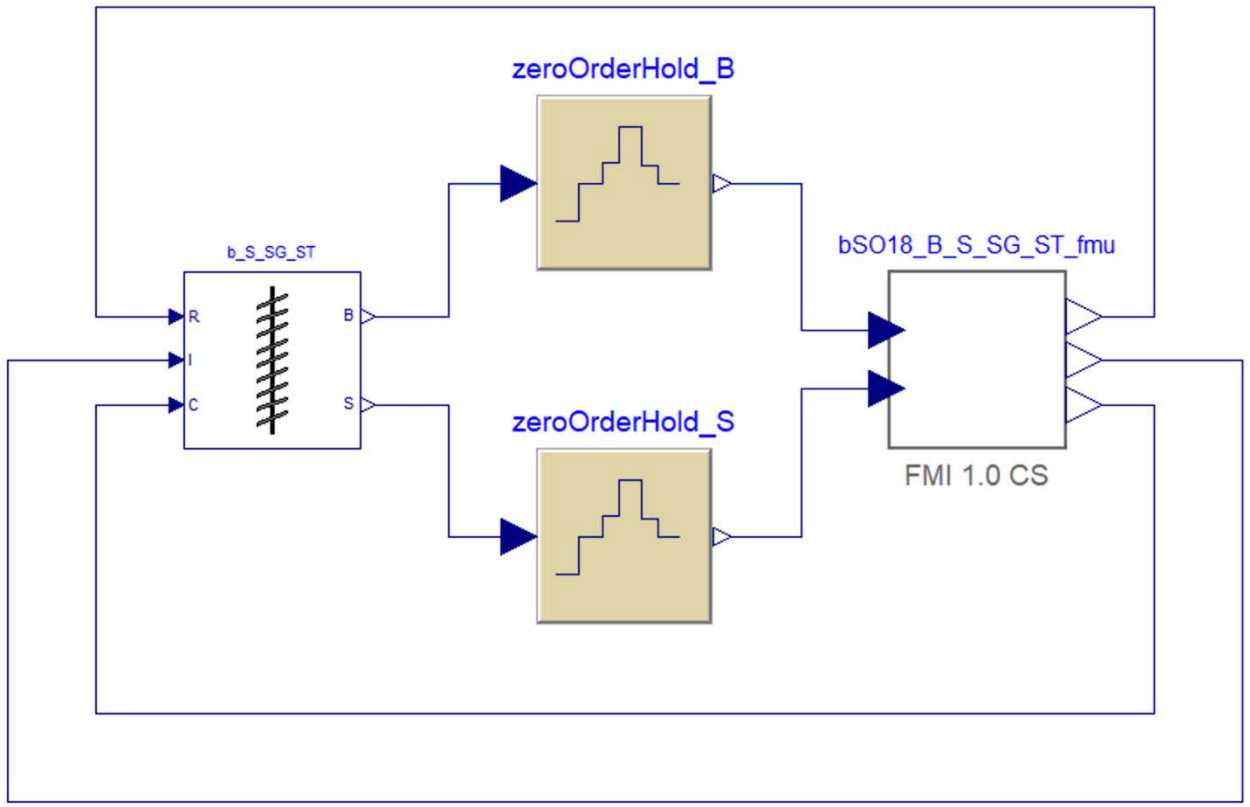



EnergyPlus

FUNCTIONAL MOCK-UP INTERFACE

DYMOLA Systems Engineering
Multi-Engineering Modeling and Simulation based on Modelica and FMI

# DYMOLA environment



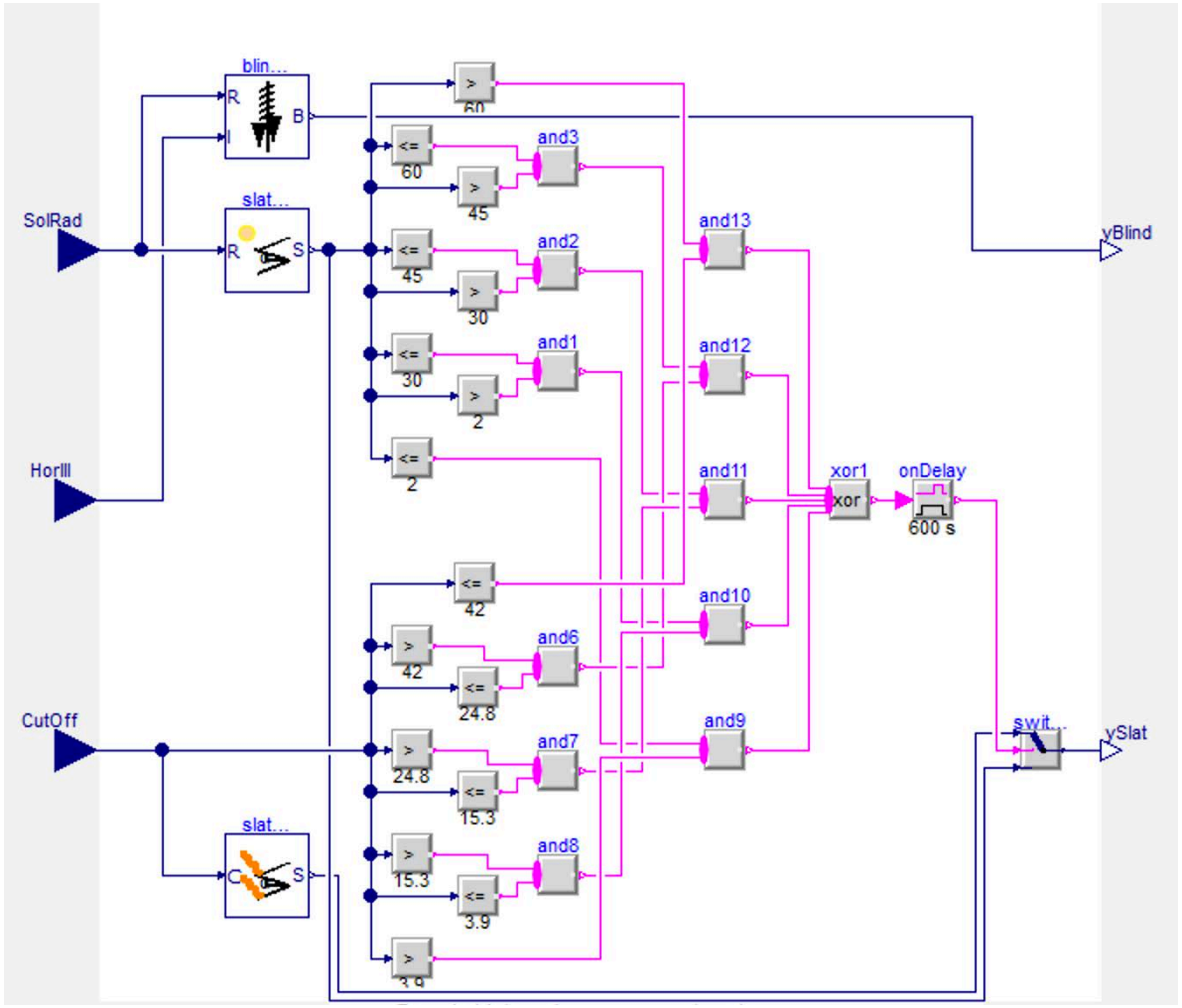

FUNCTIONAL MOCK-UP INTERFACE

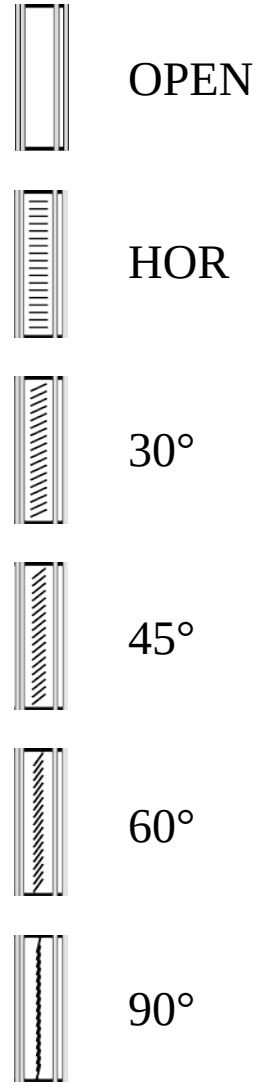
EnergyPlus

**DYMOLA Systems Engineering**

Multi-Engineering Modeling and Simulation based on Modelica and FMI

# From measurements to actuator input



OPEN

HOR

30°

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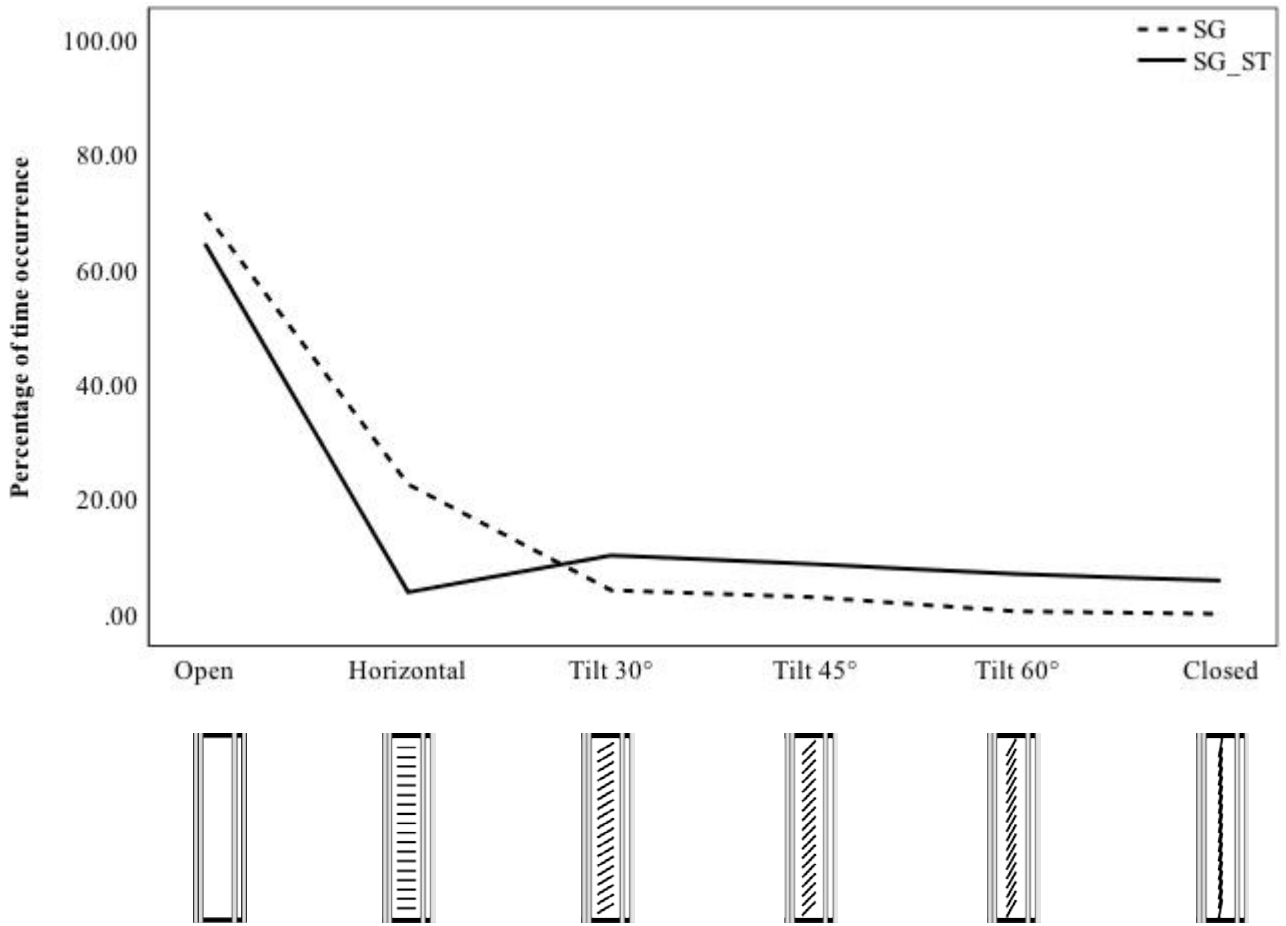
60°

90°

# Results


SG
SG_ST
100.00
80.00
60.00
40.00
20.00
.00
Percentage of time occurrence
Open
Horizontal
Tilt 30°
Tilt 45°
Tilt 60°
Closed

# Q&A?

Thank you!

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