Modelica test cases

Speaker:

Matthias Van Hove

Overview

1. General info
2. Model template
3. Test case 1: residential case
4. Test case 2: school building
5. Extra’s

General info

- Dymola 2024 (Windows)
- Modelica Standard Library - version 4.0.0

- IDEAS - version 3.0.0 (envelope, weather)
- Buildings - version 11.0.0 (technical systems)

Model template

- based on IDEAS template for building model

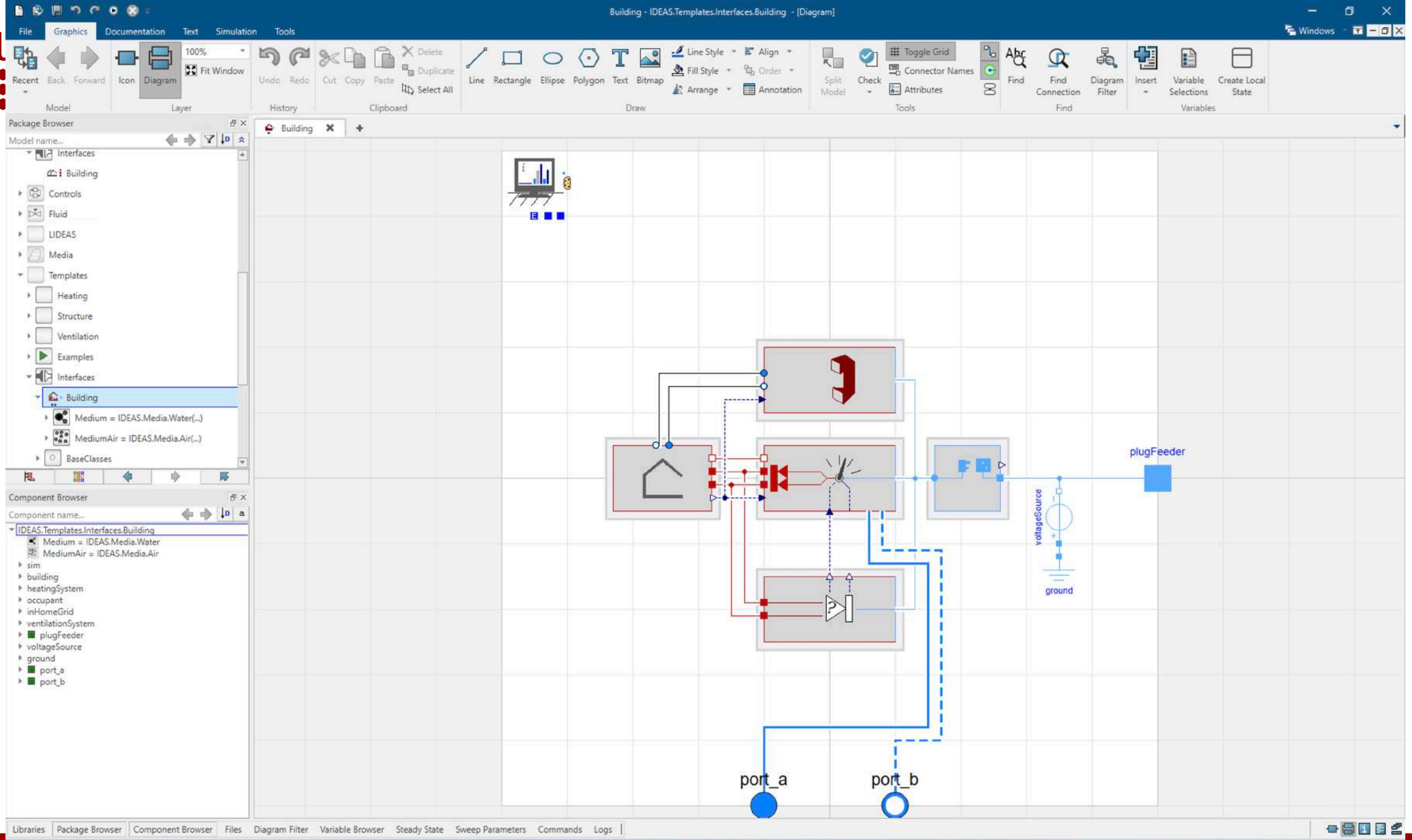
Building - IDEAS.Templates.Interfaces.Building - [Diagram]
File
Graphics
Documentation
Text
Simulation
Tools
Windows
Recent
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Diagram
100%
Fit Window
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Undo
Redo
History
Cut
Copy
Paste
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Select All
Clipboard
Line
Rectangle
Ellipse
Polygon
Text
Bitmap
Line Style
Fill Style
Arrange
Align
Order
Annotation
Draw
Split Model
Check
Toggle Grid
Connector Names
Attributes
Tools
Find
Find Connection
Diagram Filter
Find
Insert
Variable Selections
Create Local State
Variables
Package Browser
Model name...
Interfaces
Building
Controls
Fluid
IDEAS
Media
Templates
Heating
Structure
Ventilation
Examples
Interfaces
Building
Medium = IDEAS.Media.Water(...)
MediumAir = IDEAS.Media.Air(...)
BaseClasses
Component Browser
Component name...
IDEAS.Templates.Interfaces.Building
Medium = IDEAS.Media.Water
MediumAir = IDEAS.Media.Air
sim
building
heatingSystem
occupant
inHomeGrid
ventilationSystem
plugFeeder
voltageSource
ground
port_a
port_b
Building
plugFeeder
voltageSource
ground
port_a
port_b
Libraries
Package Browser
Component Browser
Files
Diagram Filter
Variable Browser
Steady State
Sweep Parameters
Commands
Logs
Search
NLD
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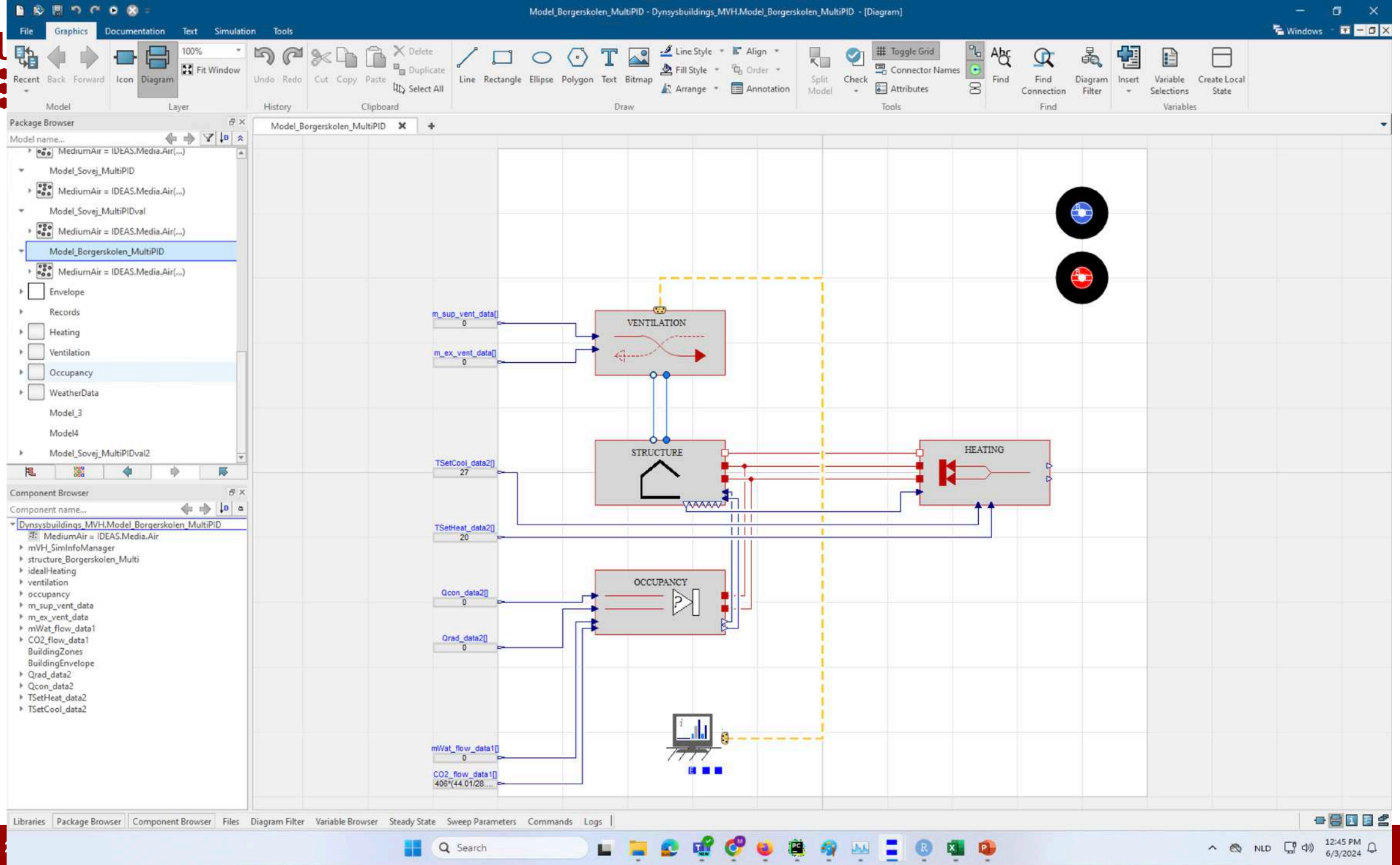
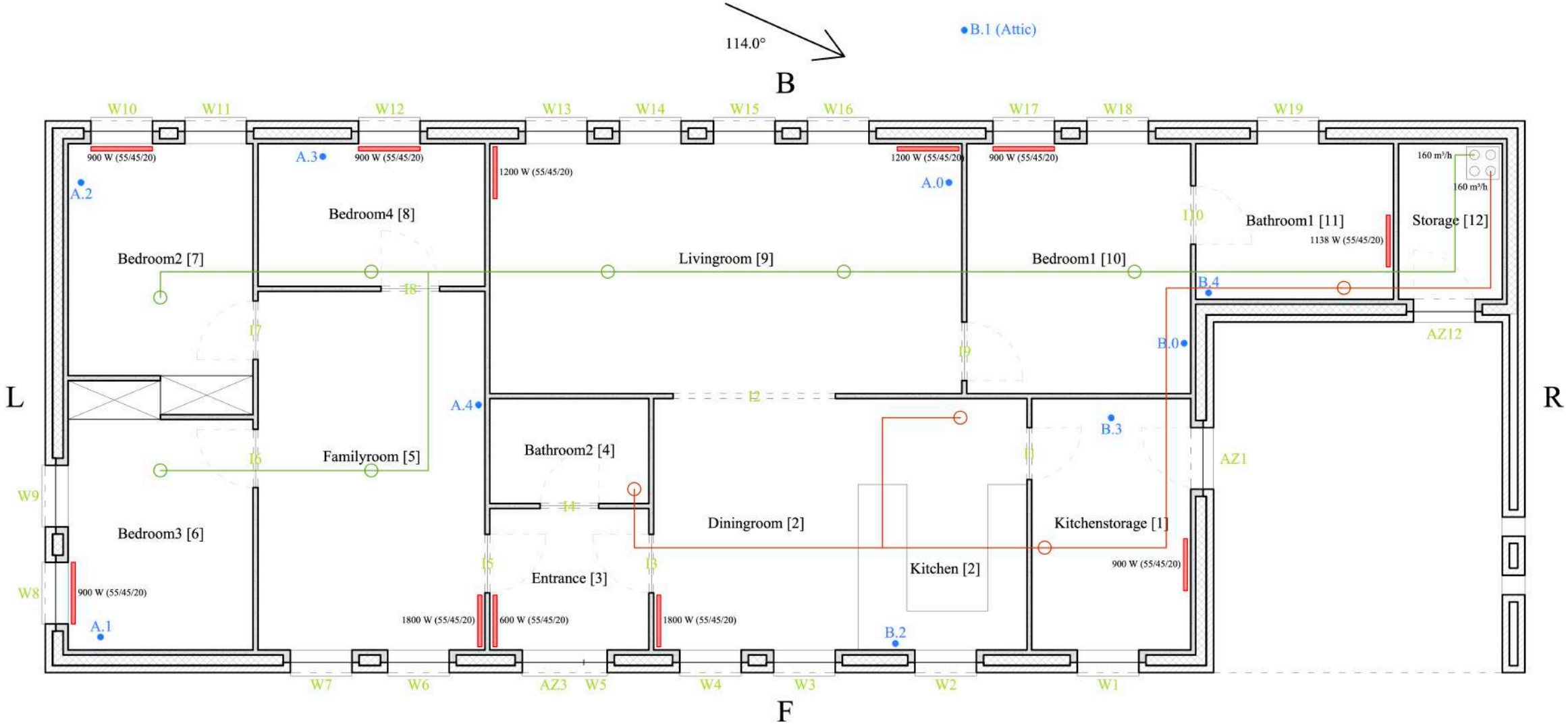

Model_Borgerskolen_MultiPID - Dynsysbuildings_MVH.Model_Borgerskolen_MultiPID - [Diagram]
File
Graphics
Documentation
Text
Simulation
Tools
Package Browser
Model_Sovej_MultiPID
MediumAir = IDEAS.Media.Air(...)
Model_Sovej_MultiPIDval
Model_Borgerskolen_MultiPID
Envelope
Records
Heating
Ventilation
Occupancy
WeatherData
Model_3
Model4
Model_Sovej_MultiPIDval2
Component Browser
Dynsysbuildings_MVH.Model_Borgerskolen_MultiPID
mVH_SimInfoManager
structure_Borgerskolen_Multi
idealHeating
ventilation
occupancy
m_sup_vent_data
m_ex_vent_data
mWat_flow_data1
CO2_flow_data1
BuildingZones
BuildingEnvelope
Qrad_data2
Qcon_data2
TSetHeat_data2
TSetCool_data2
VENTILATION
STRUCTURE
HEATING
OCCUPANCY
m_sup_vent_data[]
m_ex_vent_data[]
TSetCool_data2[]
27
TSetHeat_data2[]
20
Qcon_data2[]
Qrad_data2[]
mWat_flow_data1[]
CO2_flow_data1[]
Libraries
Package Browser
Component Browser
Files
Diagram Filter
Variable Browser
Steady State
Sweep Parameters
Commands
Logs

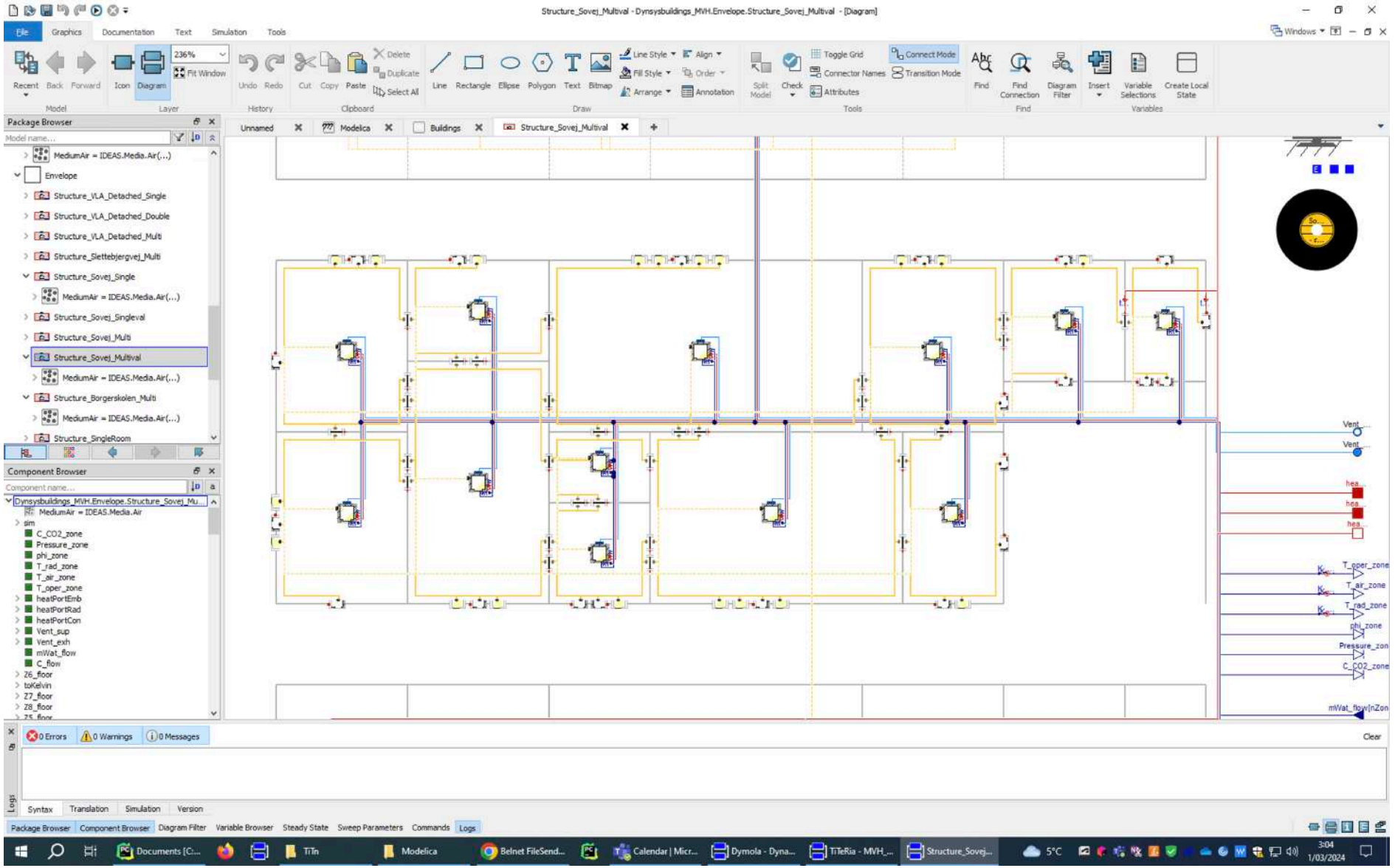
Test case 1: residential house

- real building
- detached single-family house in Høje Taastrup (Denmark)
- test case for MPC control in our research group

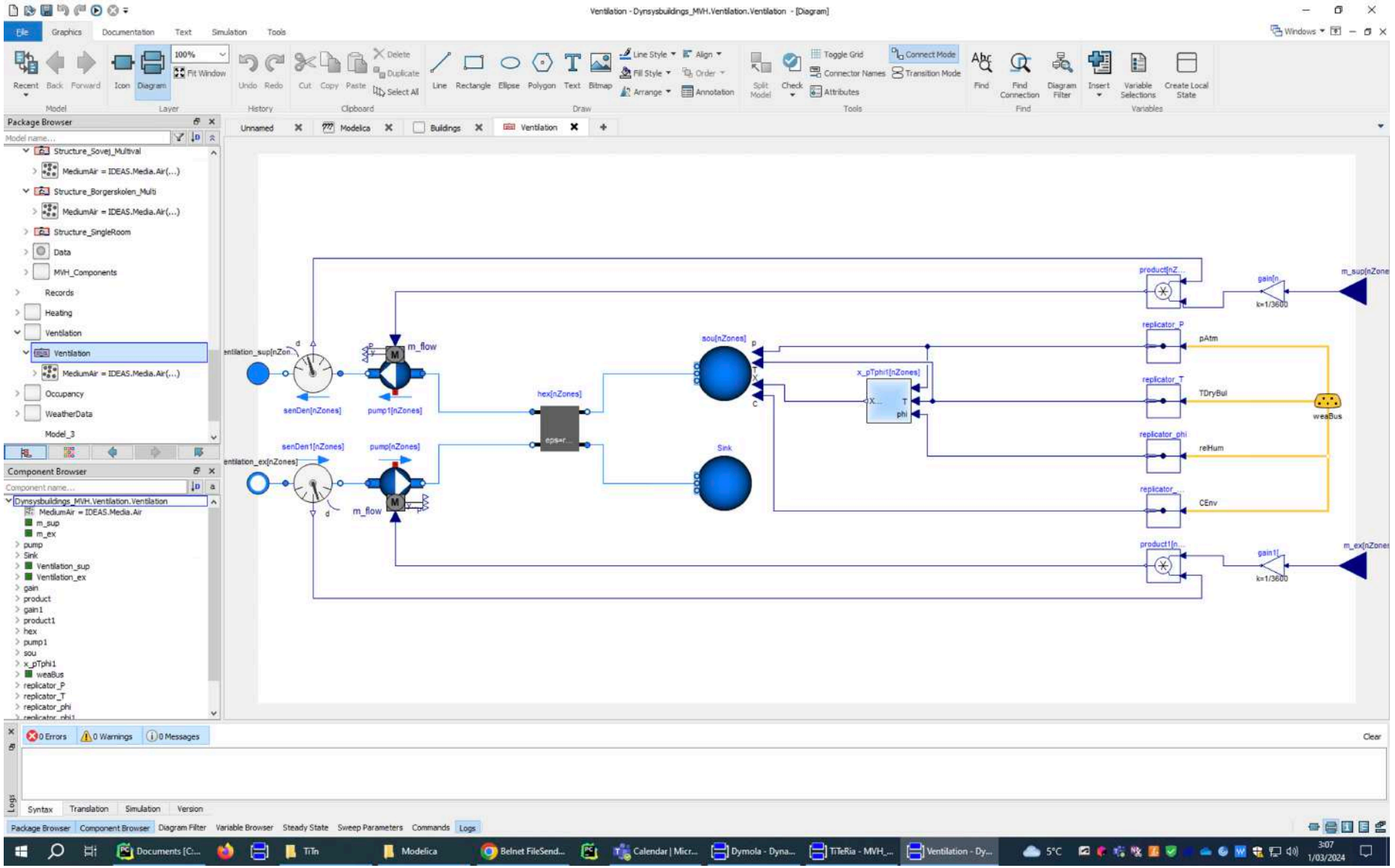
Test case 1: Floor plan



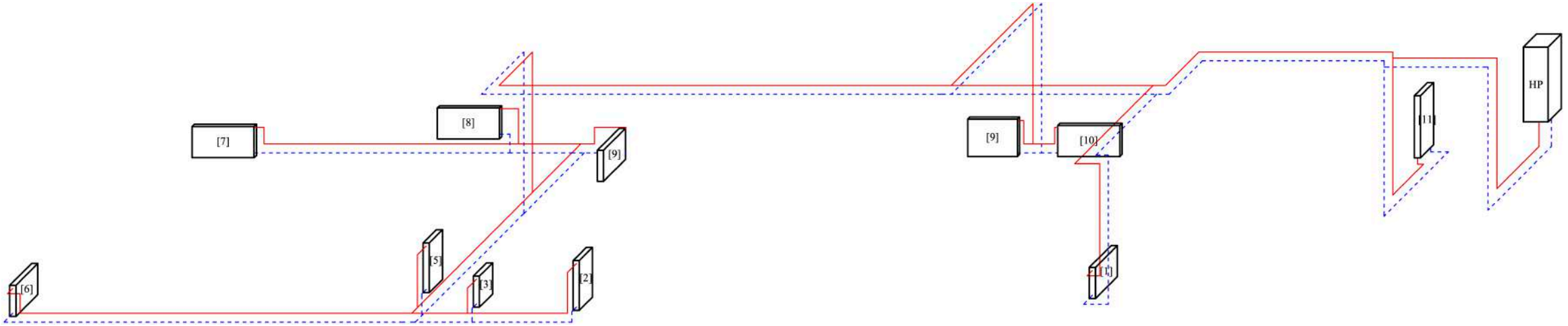
Test case 1: Envelope in modelica



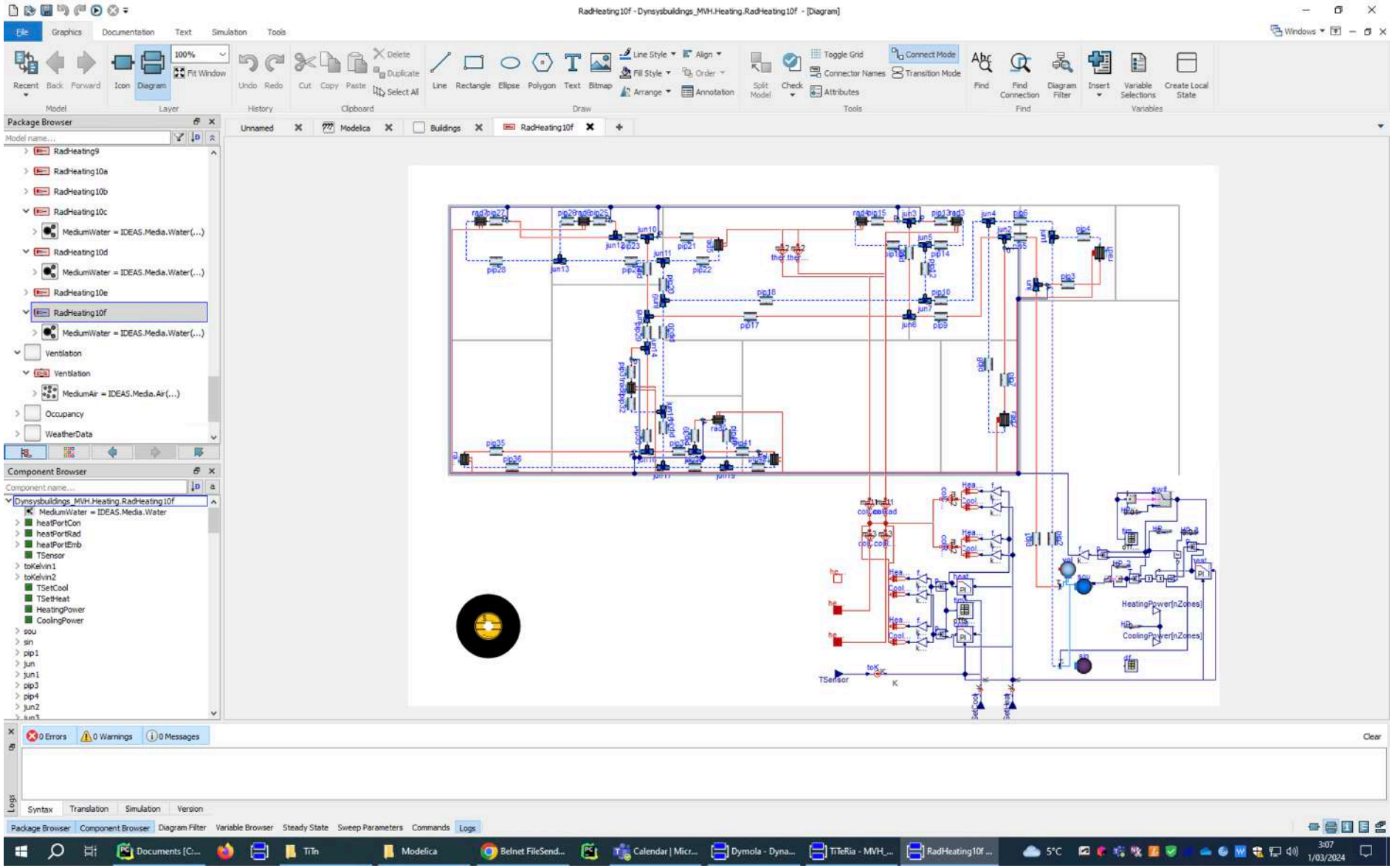
Test case 1: Ventilation system



Test case 1: Hydraulic system



Test case 1: Hydraulic system



Test case 1: notes

- libraries: IDEAS (envelope, weather), Buildings (technical systems)

- weather file type: .TMY (siminfomanager)
- weather: 2023 weather in Høje Taastrup

- envelope: no furniture
- envelope/inter-zone: buoyancy-driven flow (infiltration)

- occupancy: StROBe/EROB => convective/radiative heat, water vapor, CO2 from people and appliances

- building characteristic data: stored together in a record

- model 15min./year (ideal heating), 10h/year (radiator network)

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m people

C:\Users\mvaho\Documents\Modelica_project\Sovej 16a 2880\Data\0_Weather\0_Sovej16a_202324_weather.txt - Notepad++

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QUICKSRT.CSV | DK_2023_Tset.txt | Mathias_newsetpoints_check_001.csv | 001.csv | Mathias_newsetpoints_check_001.csv

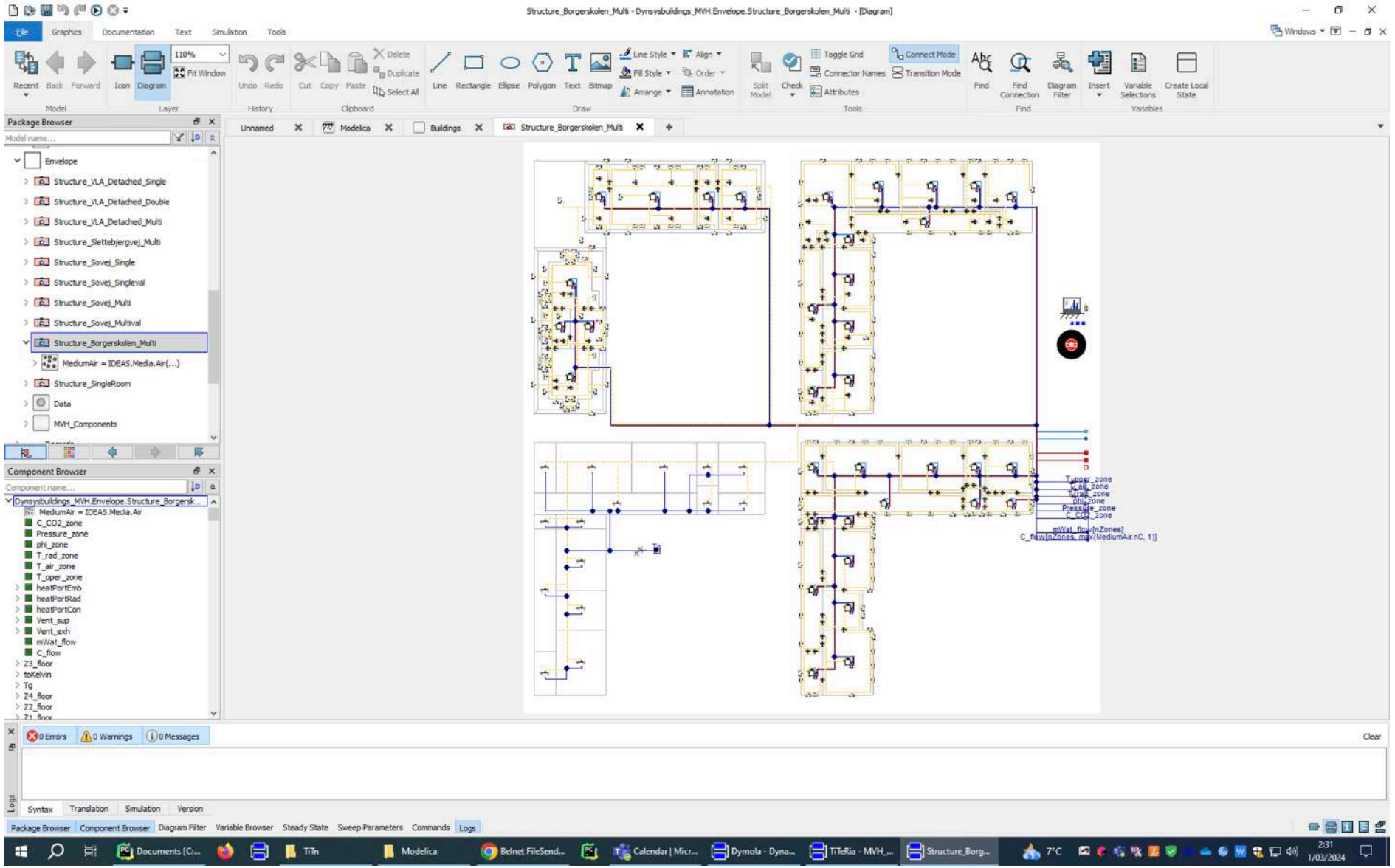
```
#1
double tab1(105121,30)
#LOCATION,Sovej 16a weather file,SJ,Denmark,TMY3,123456789,55.767028,12.455685,1.0,22
#0: C1-time
#1: C2-dry bulb temp
#2: C3-dew bulb temp
#3: C4-rel humid
#4: C5-patm
#5: C6-ext hor rad
#6: C7-ext dir nor rad
#7: C8-hor inf rad
#8: C9-glo hor rad
#9: C10-dir nor rad
#10: C11-dif hor rad
#11: C12-av glob hor ill
#12: C13-dir nor ill
#13: C14-dif hor ill
#14: C15-zen lum
#15: C16-wind direction
#16: C17-wind speed
#17: C18-tot sky cover
#18: C19-opa sky cover
#19: C20-vis
#20: C21-ceiling height
#21: C22-pres wea obs
#22: C23-pres wea cod
#23: C24-prec water
#24: C25-aer opt depth
#25: C26-snow depth
#26: C27-day last snow
#27: C28-alb
#28: C29-liq prec depth
#29: C30-liq prec quant
0.0 9.0 8.9 99 99550 0 0 0 0.00 0.00 0.00 0 0 0 0 181 1.5 0.9 0.9 600 80 0 0 0 0 0 0 0 0 0
600.0 9.0 8.9 99 99550 0 0 0 0.00 0.00 0.00 0 0 0 0 181 1.5 0.9 0.9 600 80 0 0 0 0 0 0 0 0 0
1200.0 9.0 8.9 99 99550 0 0 0 0.00 0.00 0.00 0 0 0 0 181 1.5 0.9 0.9 600 80 0 0 0 0 0 0 0 0 0
1800.0 9.0 8.9 99 99550 0 0 0 0.00 0.00 0.00 0 0 0 0 181 1.5 0.9 0.9 600 80 0 0 0 0 0 0 0 0 0
2400.0 9.0 8.9 99 99550 0 0 0 0.00 0.00 0.00 0 0 0 0 181 1.5 0.9 0.9 600 80 0 0 0 0 0 0 0 0 0
3000.0 9.0 8.9 99 99550 0 0 0 0.00 0.00 0.00 0 0 0 0 181 1.5 0.9 0.9 600 80 0 0 0 0 0 0 0 0 0
3600.0 9.0 8.9 99 99550 0 0 0 0.00 0.00 0.00 0 0 0 0 181 1.5 0.9 0.9 600 80 0 0 0 0 0 0 0 0 0
4200.0 8.9 8.8 99 99540 0 0 0 0.00 0.00 0.00 0 0 0 0 179 1.8 0.9 0.9 400 80 0 0 0 0 0 0 0 0 0
```

Test case 2: School building

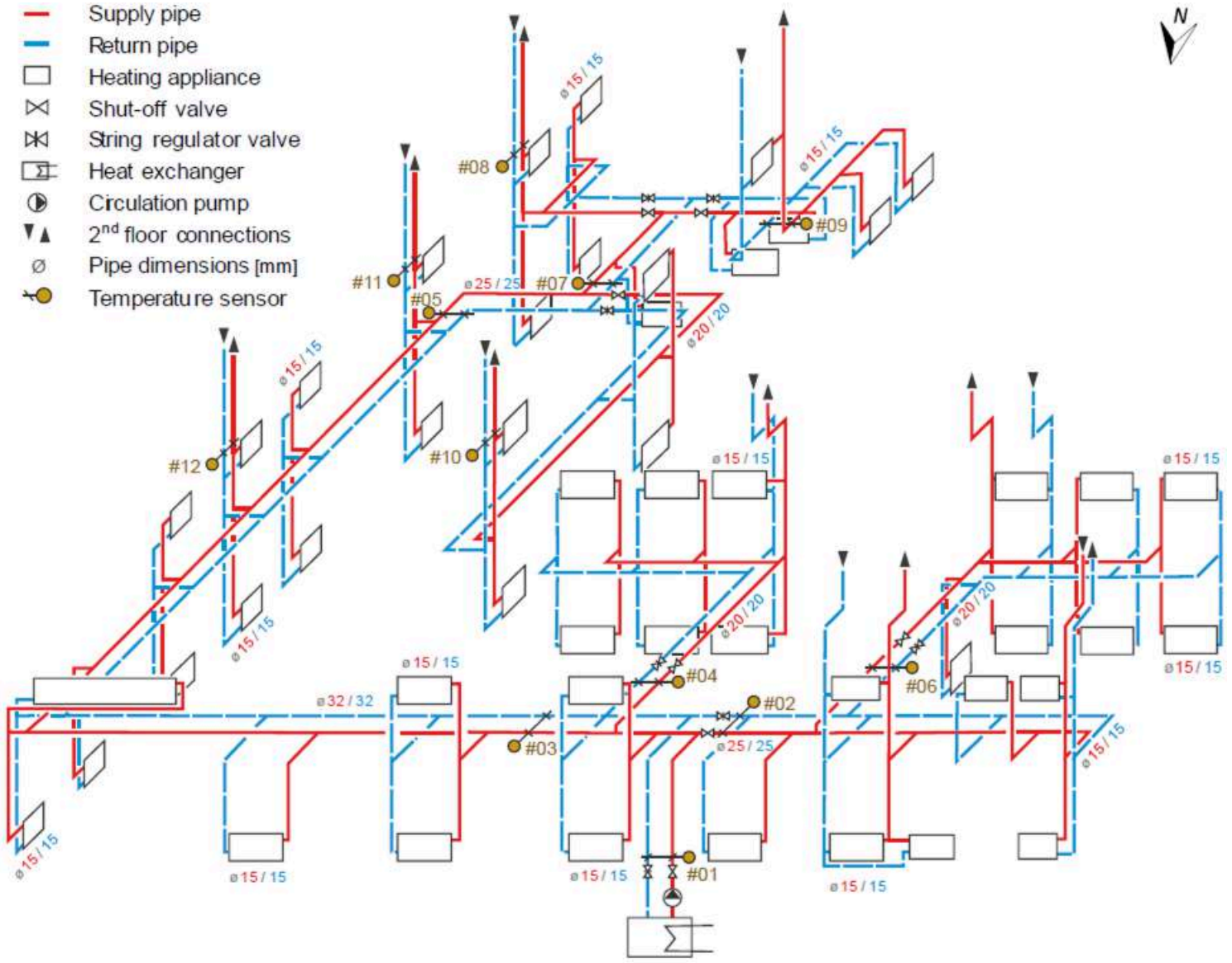
- real building
- detached school building in Høje Taastrup (Denmark)
- test case for MPC control in our research group

Test case 2: Floor plan

Test case 2: Envelope in modelica

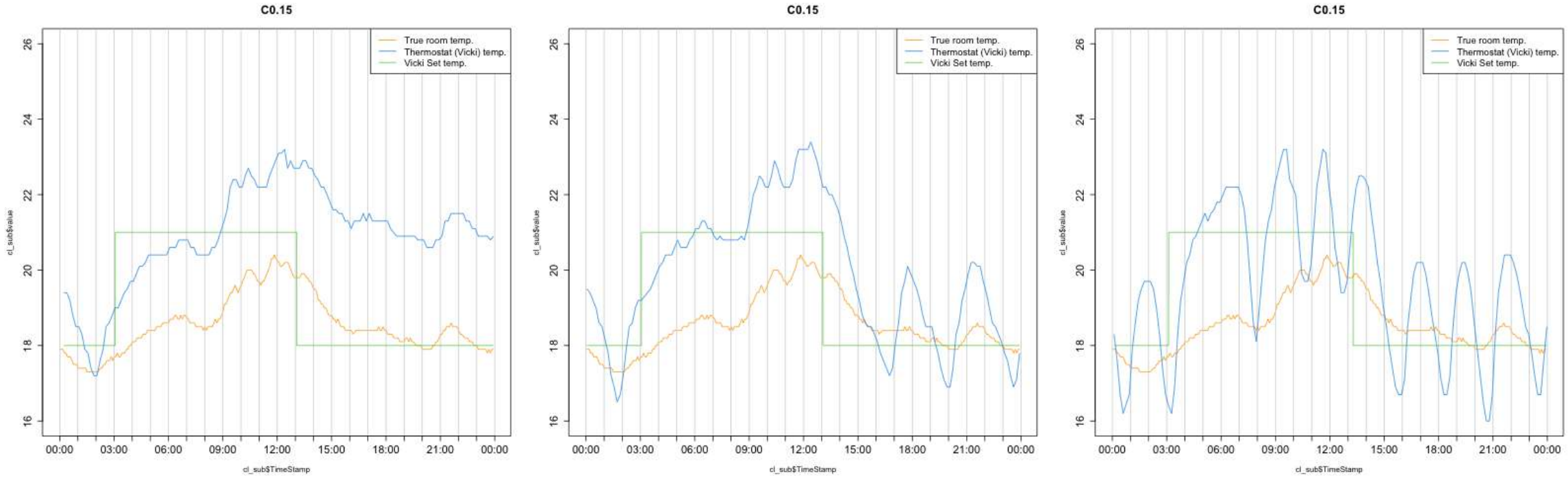


Test case 2: Hydraulic system

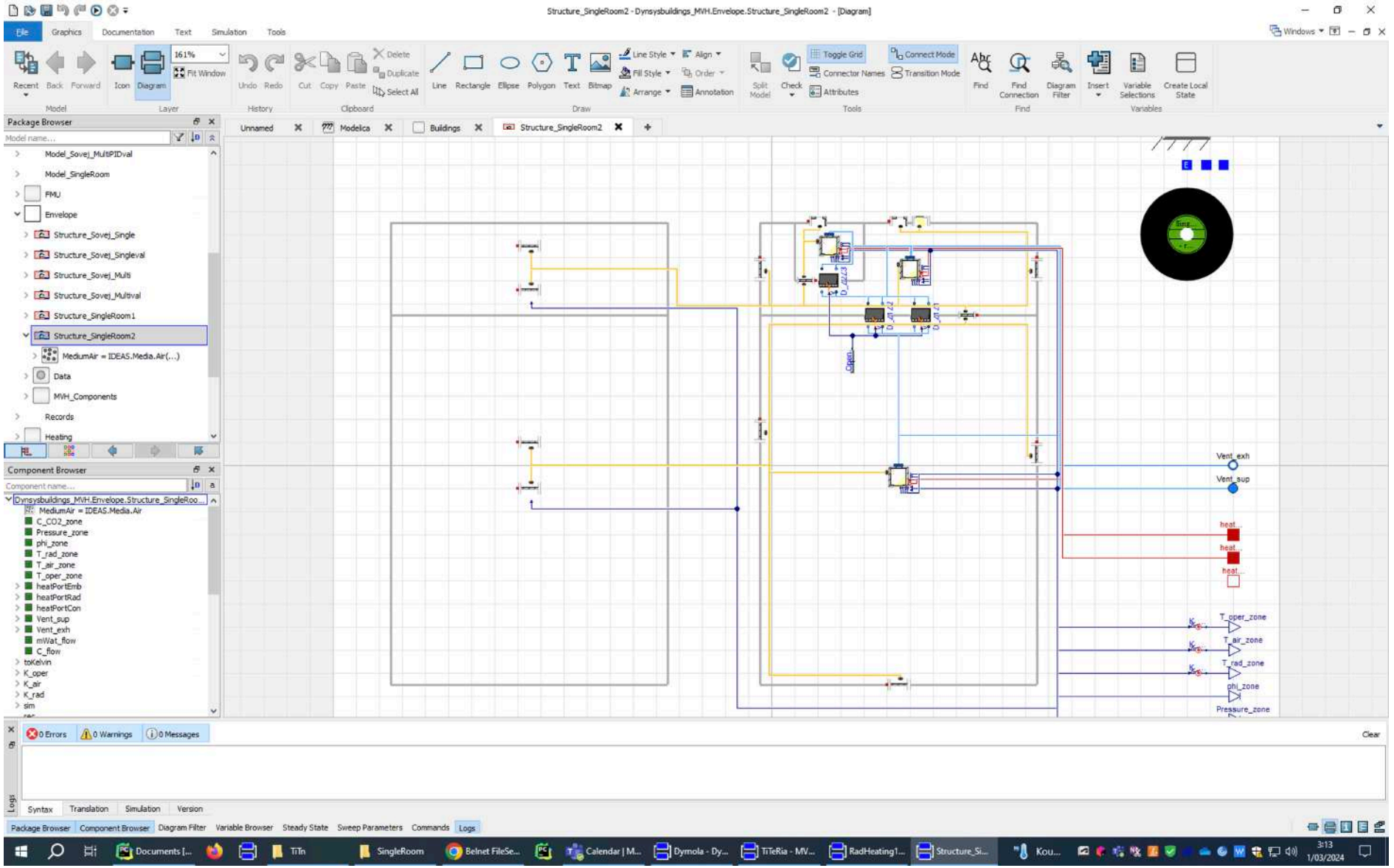


Varia: room model

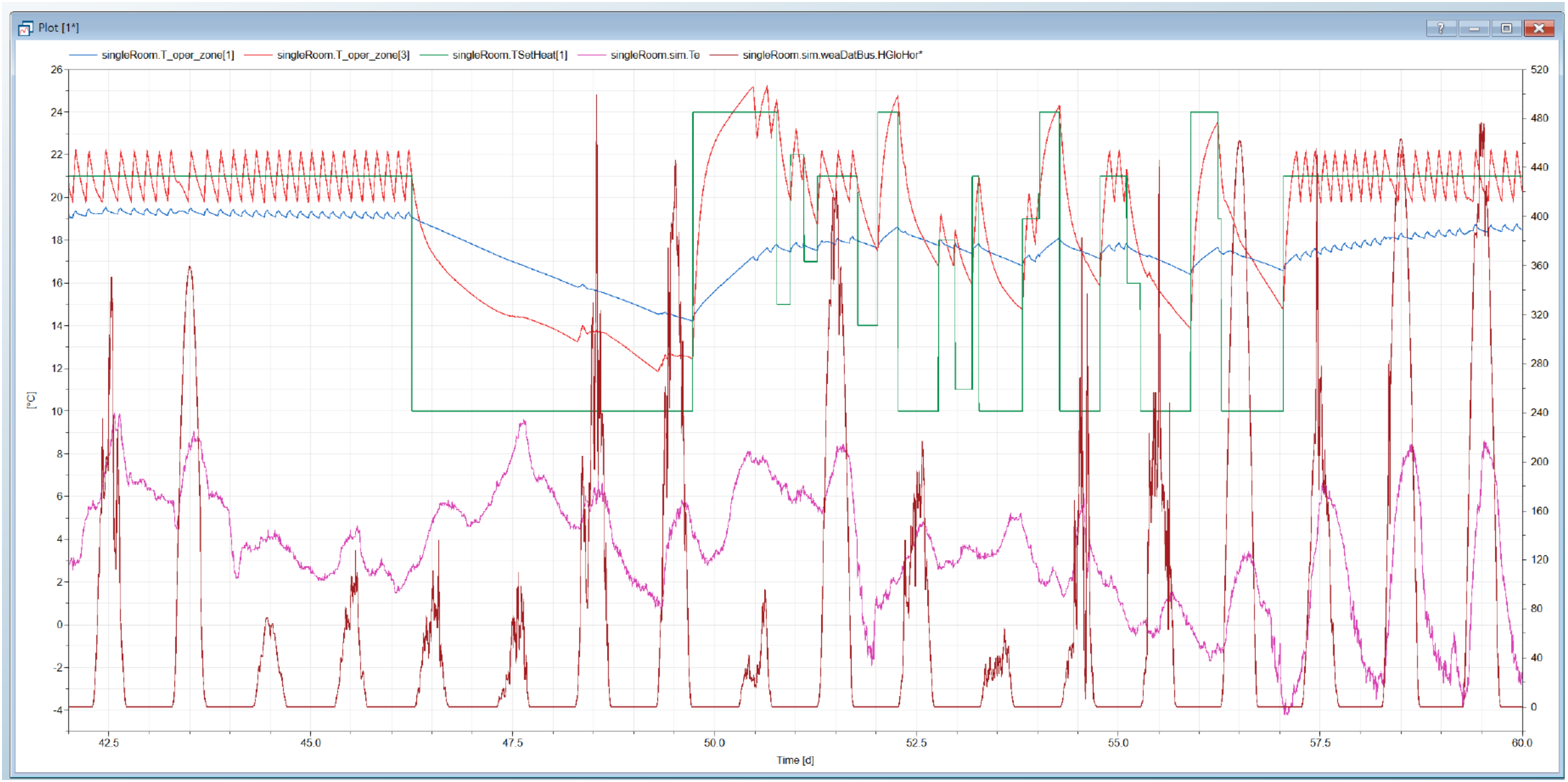
- Measurements show temperature difference between radiator thermostat and room
- MPC to reach setpoint in room by correcting thermostat



Varia: room model



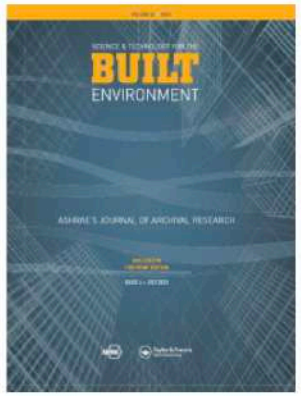
Varia: room model



Varia: new test cases next winter

- 5 real dwellings in Høje Taastrup (Denmark)
- test case for MPC control by Dynsys
- measurement campaigns next winter in all 5

Varia: Validated model of a case study



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Science and Technology for the Built Environment

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/uhvc21

In-situ empirical validation of common indoor climate parameters in an inhabited multizone dwelling

Matthias Yvan Chris Van Hove, Josué Borrajo Bastero, Marc Delghust & Jelle Laverge

Modelica test cases

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