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IDEAS outline

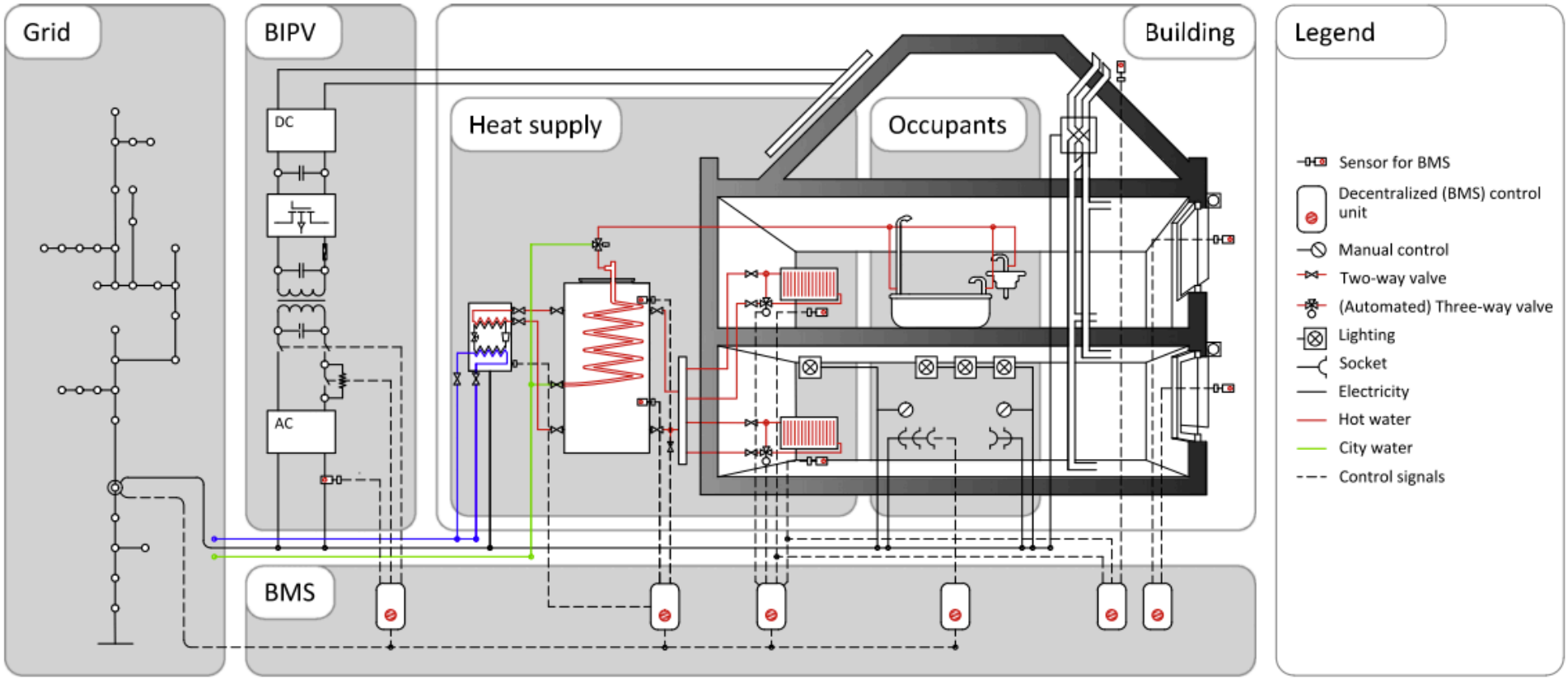
Modelica course Porticcio

IDEAS

- Integrated District Energy Assessment by Simulation

- 3 main packages: Joint development at KU Leuven
  - Buildings – Building physics
  - Fluid – Mechanical engineering
  - Electric – Electrical engineering

IDEAS



Baetens, R., De Coninck, R., Van Roy, J., Verbruggen, B., Driesen, J., Helsen, L., & Saelens, D. (2012). Assessing electrical bottlenecks at feeder level for residential net zero-energy buildings by integrated system simulation. Applied Energy, 96, 74–83. http://doi.org/10.1016/j.apenergy.2011.12.098

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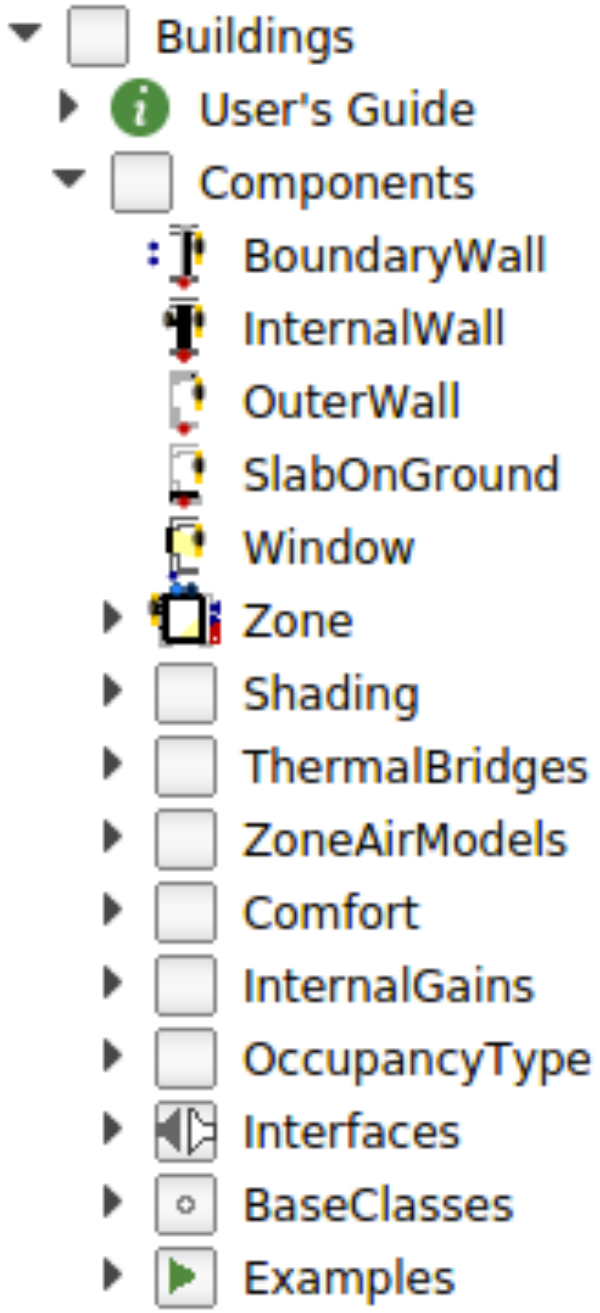
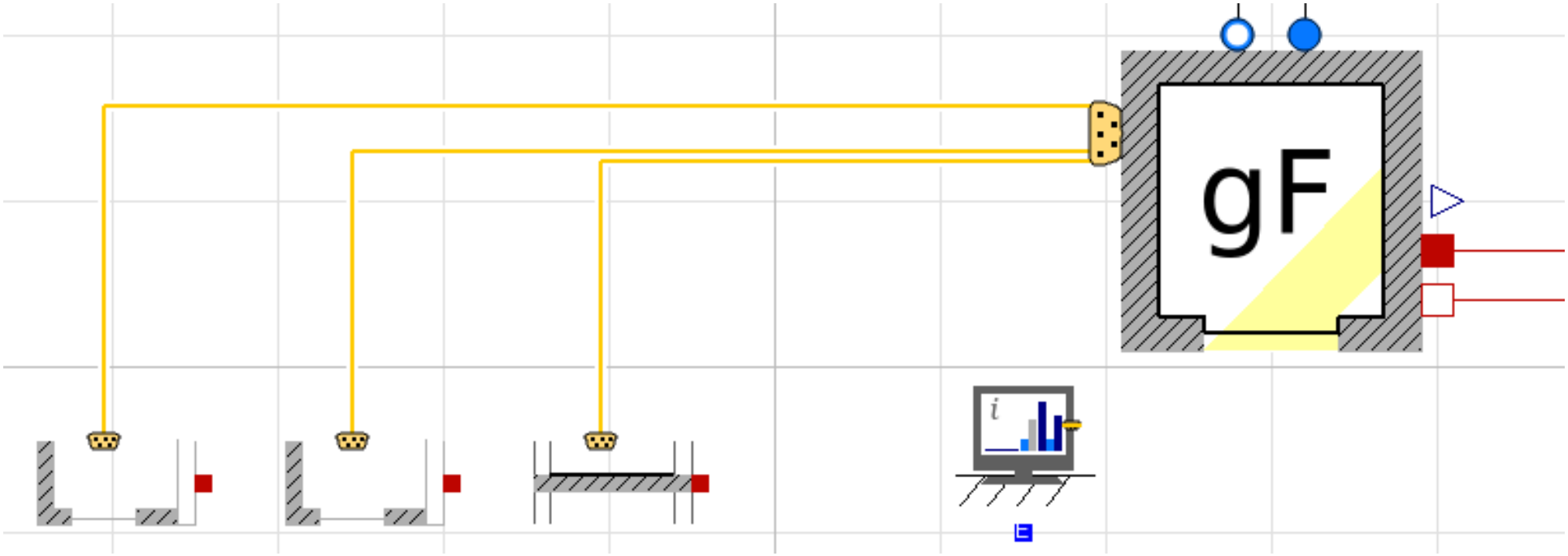
IDEAS

- Buildings package



IDEAS

- Example useability



gF in IDEAS.Buildings.Validation.BaseClasses.Structure.Bui600

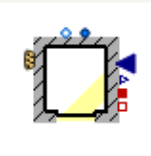
General | Advanced | Initialization | Add modifiers

Component

Name: gF

Comment:

Icon



Model

Path: IDEAS.Buildings.Components.Zone

Comment: Building zone model

Parameters

nSurf	8		Number of surfaces adjacent to and heat exchangeing with the zone

Building physics

V	129.6	m3	Total zone air volume
hZone	2.7	m	Zone height: distance between floor and ceiling
A	V/hZone	m2	Total conditioned floor area
n50	0.822*0.5*20		n50 value cfr airtightness, i.e. the ACH at a pressure diffence of 50 Pa
airModel	airModel(mSenFac=0.822)		Zone air model

Occupants

occTyp	redeclare parameter OccupancyType.PartialOccu	Occupancy type, only used for evaluating occupancy model and comfort model
intGai	redeclare InternalGains.None intGai(occupancyTy	Internal gains model
comfort	redeclare Comfort.None comfort(occupancyType=	Comfort model

OK | Info | Cancel

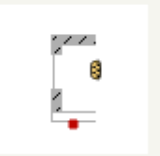
General | Advanced | Dynamics | Convection | Radiation | Add modifiers

Component

Name: roof

Comment:

Icon



Model

Path: IDEAS.Buildings.Components.OuterWall

Comment: Opaque building envelope construction

Parameters

inc	IDEAS.Types.Tilt.Ceiling	rad	Inclination (tilt) angle of the wall, see IDEAS.Types.Tilt
azi	IDEAS.Types.Azimuth.S	rad	Azimuth angle of the wall, i.e. see IDEAS.Types.Azimuth
AWall	48	m2	Component surface area

Construction details

constructionType	redeclare parameter Data.Constructions.LightRoof constructio		Building component material structure
insulationType	redeclare parameter Data.Insulation.fiberglass insulationType		Thermal insulation type, propagated into constructionType
insulationThickness	0.1118	m	Thermal insulation thickness

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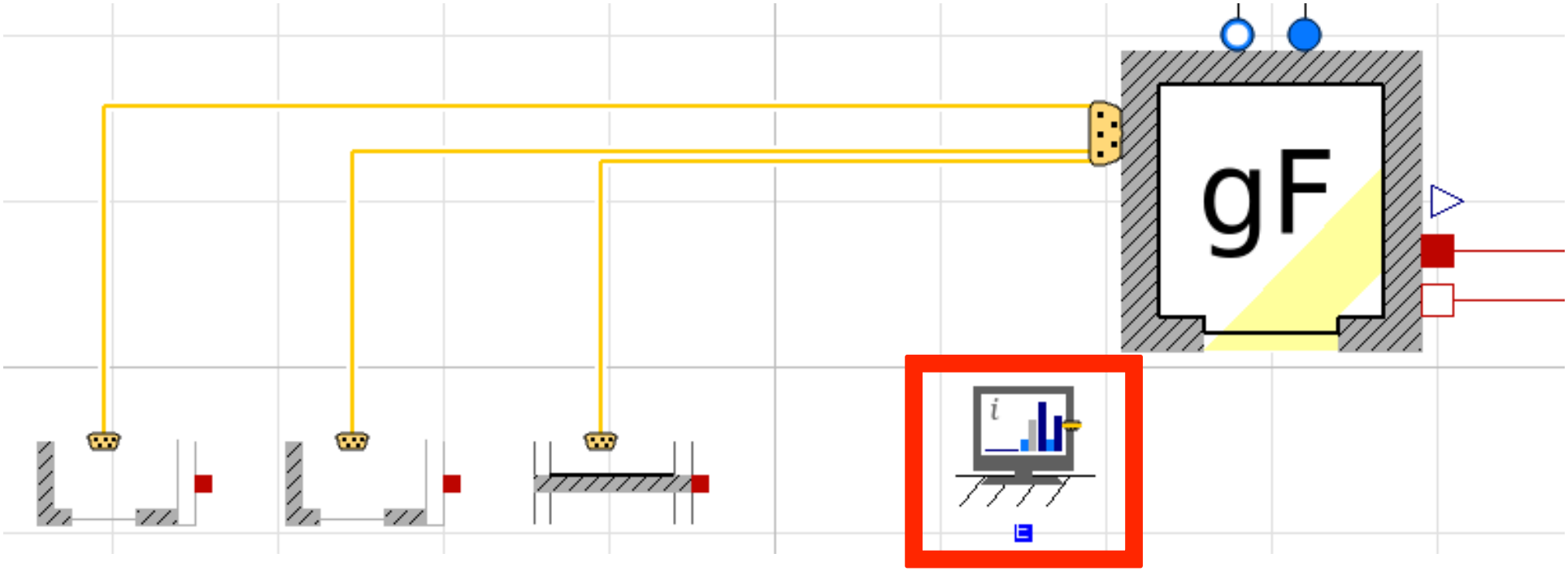
IDEAS

- SimInfoManager



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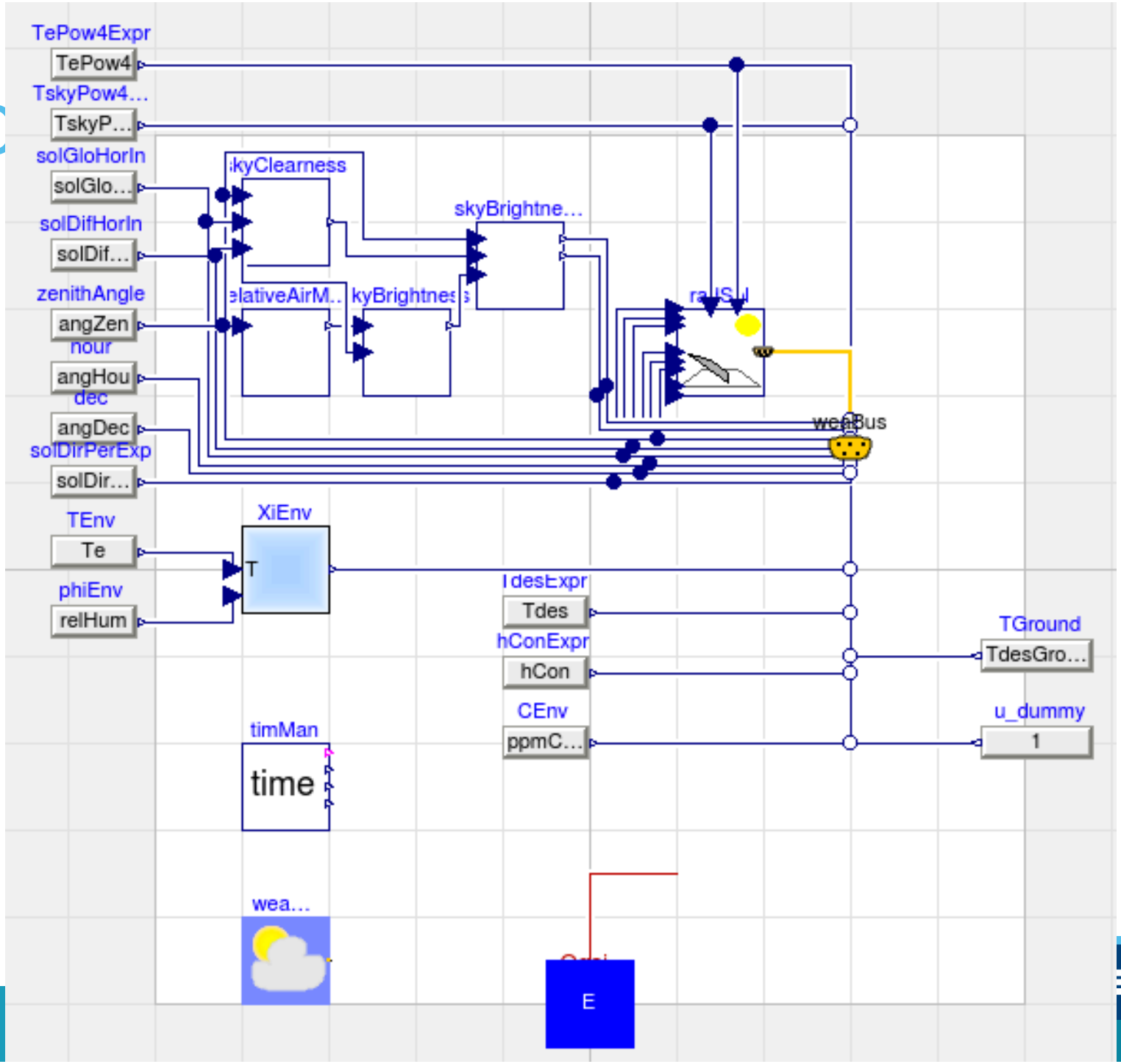
TePow4Expr
TePow4
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solGloHorIn
solGlo...
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E

Use case: MPC automatisation

Building
- BIM
- Plans

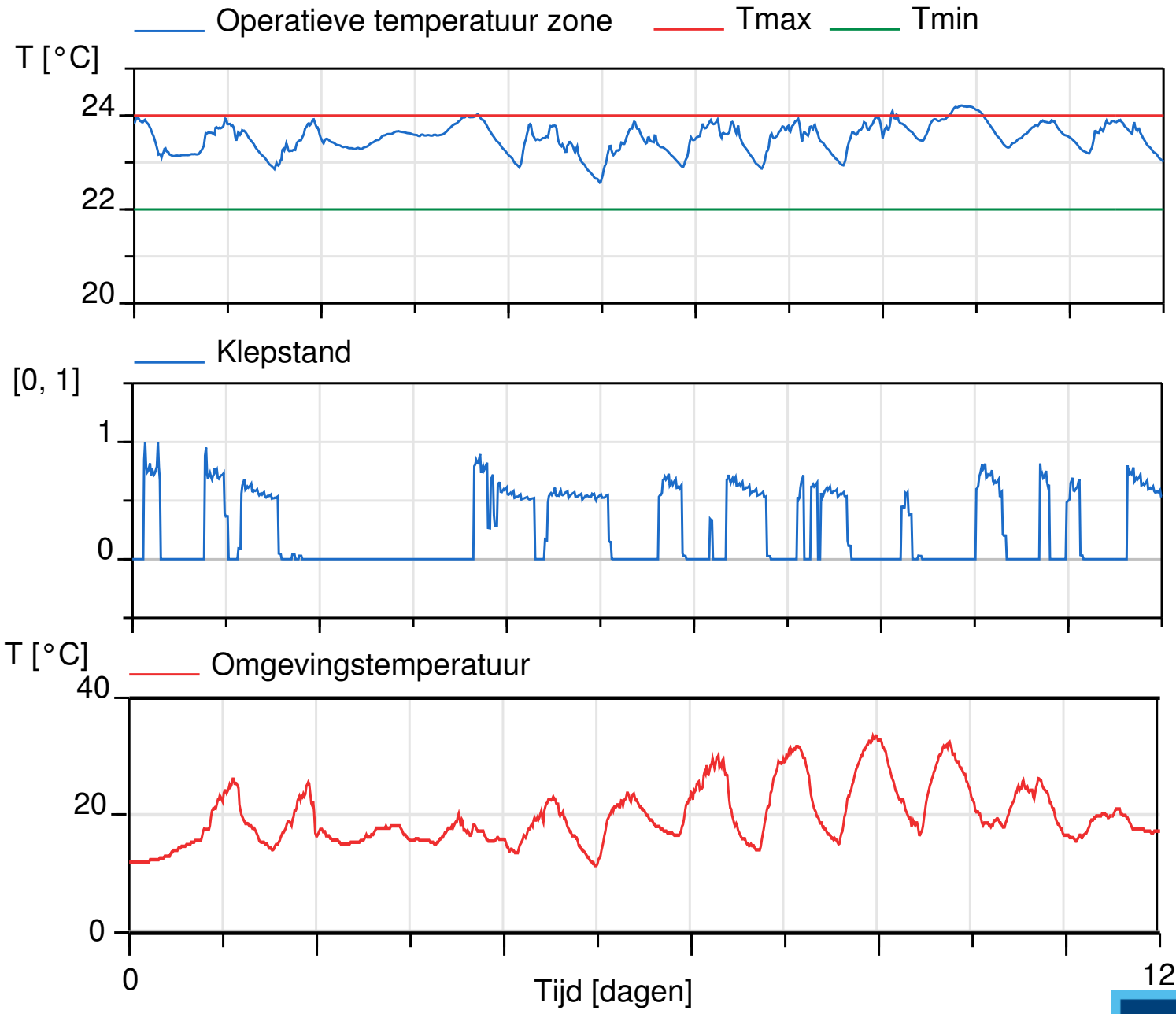
Computer model
- Modelica
- IDEAS

Controller
- Custom
- JModelica

- BIM -> Modelica:
  - Remmen, P., Cao, J., Ebertshäuser, S., Frisch, J., Lauster, M., Maile, T., … van Treeck, C. (2015). An open framework for integrated BIM-based building performance simulation using Modelica. In J. Mathur & V. Garg (Eds.), Building Simulation 2015 (pp. 379–386). Hyderabad, India.

Bron: Femke Toele

- IDEAS:
  - Extending moels
- IDEAS-model -> controller model (custom)
  - Jorissen, F., & Helsen, L. (2016). Towards an Automated ToolChain for MPC in Multi-zone Buildings. In International High Performance Buildings Conference. West-Lafayette, Indiana.


Operatieve temperatuur zone
Tmax
Tmin
T [°C]
24
22
20
Klepstand
[0, 1]
1
0
T [°C]
Omgevingstemperatuur
40
20
0
0
Tijd [dagen]
12

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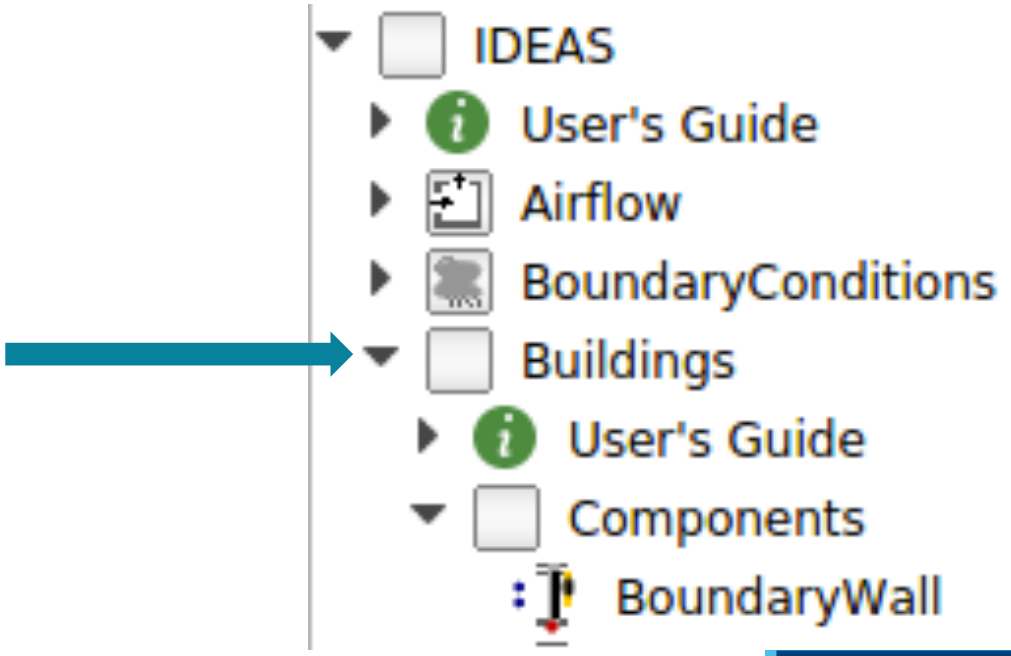
Future developments

- Composed zone models
- Depends on research projects and PhDs
- Optimization using JModelica
- Future scope: broader user base?

Conclusion

- ‘Every good simulation starts with good IDEAS’
  - Lea Gondian

- IDEAS, because for us Buildings is just a package



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