BERKELEY LAB
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IBPSA Project 2

BOPTEST

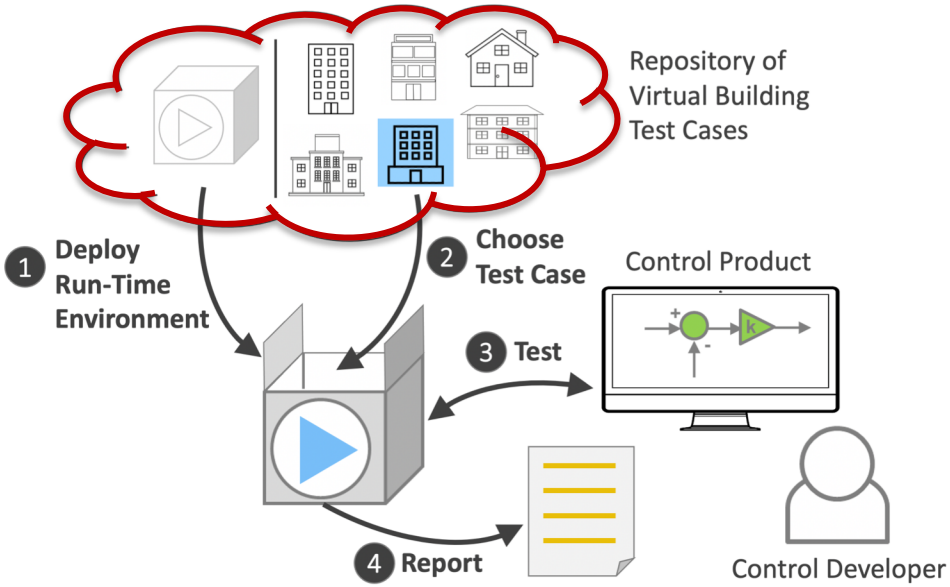
U.S. DEPARTMENT OF ENERGY
Office of Science

BS2025 workshop. IBPSA Project 2 Task 3: test case development

Ettore Zanetti ezanetti@lbl.gov

8/28/25

Test Cases Technical objectives



This task focuses on development and maintenance of benchmark test cases. Test case development utilizes the Modelica language and Functional Mockup Interface (FMI) standard.

Modelica Language

fmi Functional Mock-Up Interface

All models use open-source libraries that extend from the Modelica IBPSA Library maintained by IBPSA Modelica working group.

IBPSA Modelica working group

An Expanding Repository of Test Cases

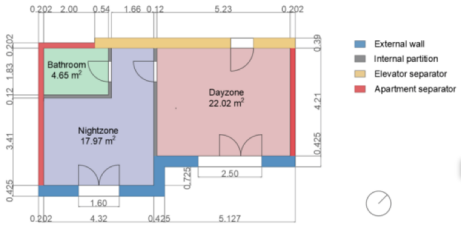
8 test cases available in v0.8, 1 available in next releases, 4 under development
4 air based systems, 5 hydronic, and 4 hybrid
8 commercial and 5 residential buildings

<id>_<building type>_<HVAC>_<#zones>_ <city>

BESTEST Air 1 Zone, FCU	**BESTEST Hydronic** 1 Zone, Radiator
BESTEST Hydronic Heat Pump 1 Zone, Radiant Floor, Heat Pump	**Single Zone Commercial Hydronic** 1 Zones, DH, DCV AHU
Two Zone Apartment Hydronic 2 Zones, Radiant Floor, Heat Pump	**Multizone Residential Hydronic** 6 Zones, Radiators, Boiler
Multizone Office Simple Air 5 Zones, 1 VAV AHU, Heat Pump, Chiller	**Multizone Office Simple Hydronic** 2 Zones, Radiators, FCU, Heat pump
Multizone Office Complex Air 15 Zones, 3 VAV AHUs, Boiler, Chiller	**Flexible Research Platform** 10 Zones, 1 VAV RTU, DX, Ele. Heat
TC11_School_Hybrid_25zon_Quebec 25 zones, RTUs, AHU, VAV, radiators and high T TES	**TC12_House_Hydro_12zon_Copenhagen** 12 zones, radiator, floor heating, heat pump
TC13_School_Hybrid_37zon_Copenhagen 37 zones radiator, district heating, AHU for ventilation	

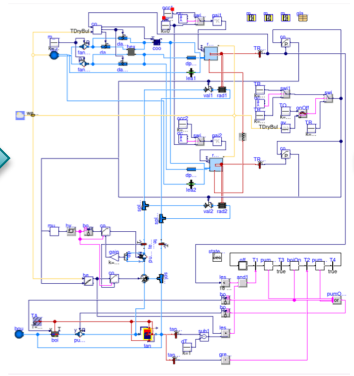
Available in v0.8 | Available in next releases | Under development

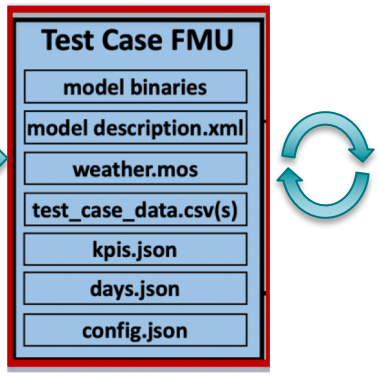
Test case development: Data Collection



External wall

N	Description	x [m]	k [W/(mK)]	c [J/(kg K)]	d [kg/m³]	absIR [-]	absSol [-]
1	Exterior plaster	0.005	0.300	840	1300	0.9	0.6
2	EPS 120 thermal insulation panel	0.1	0.034	1250	23	-	-
3	Masonry brick	0.3	0.207	840	750	-	-
4	Gypsum plaster	0.02	0.570	1000	1300	0.9	0.6





Data collection

Model development

Make test case BOPTEST ready

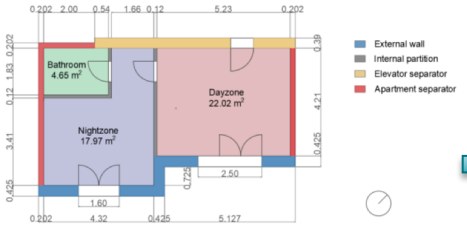
Test case peer review

- Realistic building configuration, envelope properties, and internal gains

Resources:

- Create cheat sheet with ”typical” values

Test case development: Model Development



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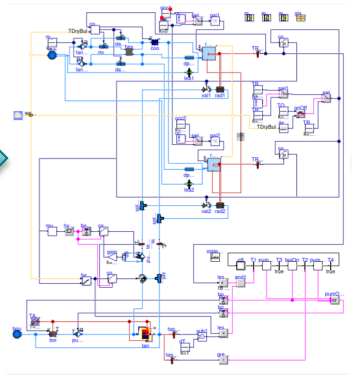

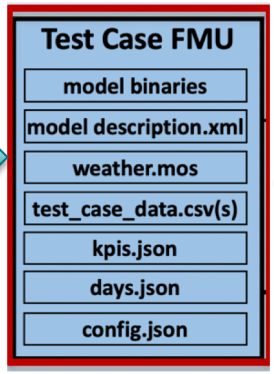

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- High fidelity building and HVAC models in Modelica including signal exchange I/O blocks.

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- Test case dedicated discussion tab in the repository

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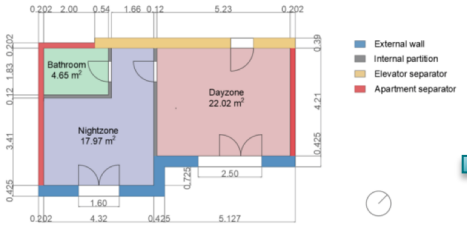
Test case peer review

Test case development: BOPTEST ready Test Case



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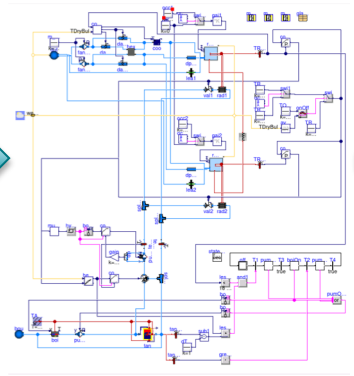

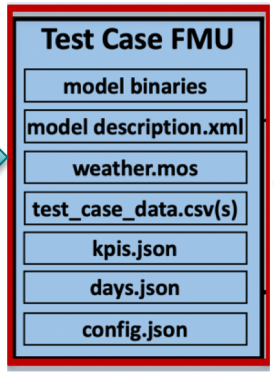

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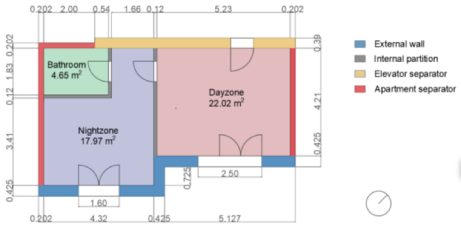
- Test case compilation through parser.py workflow
- Have well documented utility scripts to help with the process

Test case peer review

Test case development: Peer Review



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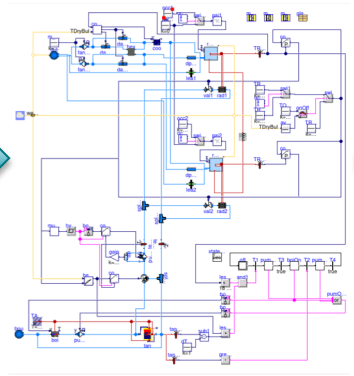

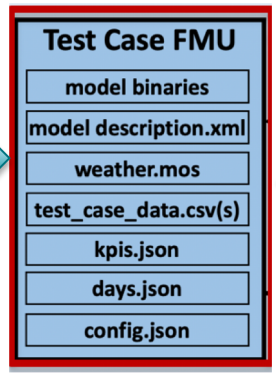

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Test case peer review

- Every test case needs a second pair of eyes.

Resources:

- Review document
- Test case stress test script

JOIN us! Any questions?

Thank you!
Any Questions?

Email: ezanetti@lbl.gov