

HVAC Control Simulation using Spawn-of-EnergyPlus

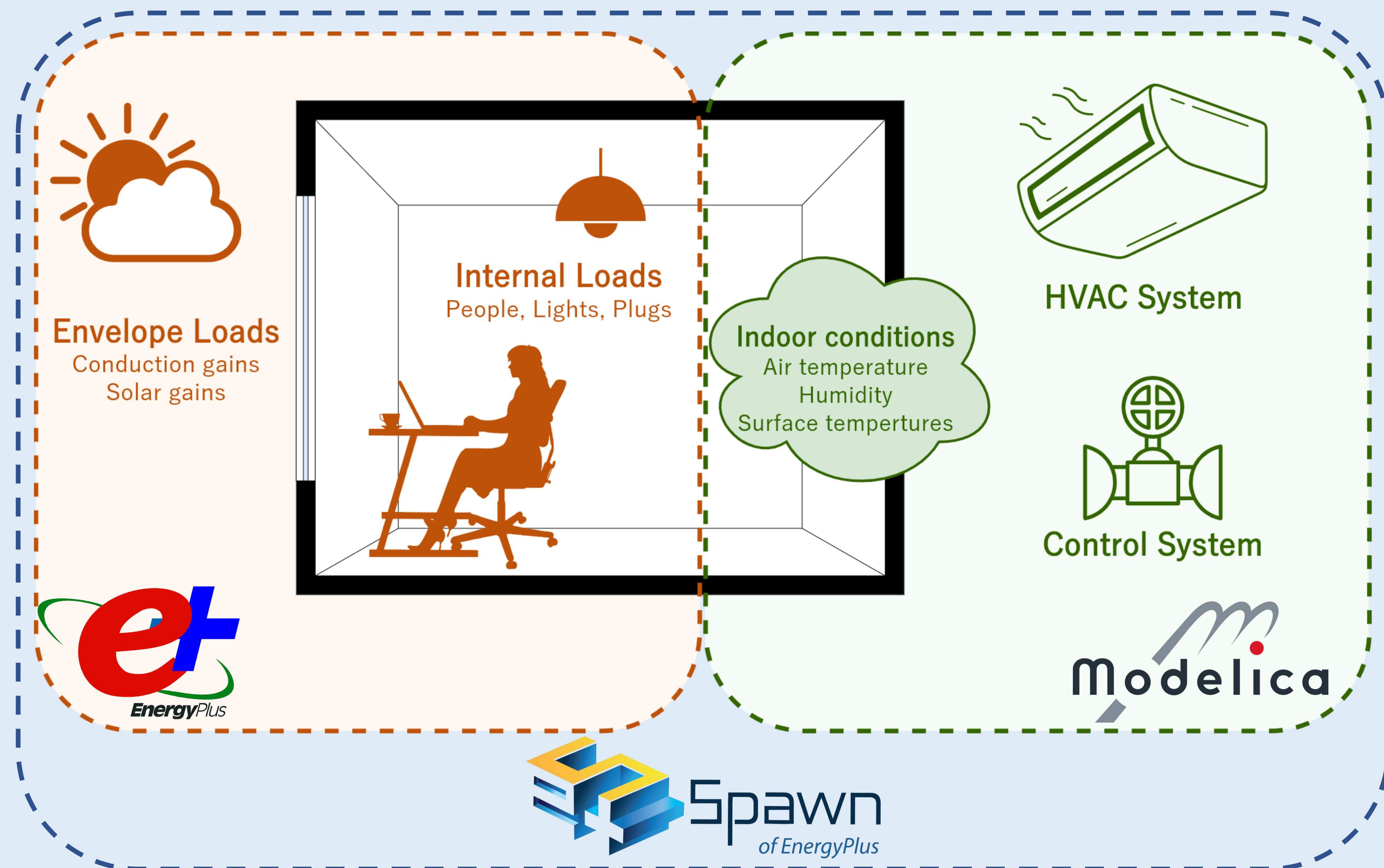
Background

- **The need to test new energy efficiency measures**
When new technologies or control schemes are proposed, simulation tools are needed to test the energy savings effect on the designed building.
- **Limitations of existing simulation tools**
Most existing programs limit the user inputs and building designers cannot accurately test the effects of their energy efficiency measures.

Purpose

- **Utilizing Spawn-of-EnergyPlus (Spawn)**
For analyzing systems which require complex control schemes such as district energy systems or thermal energy storage, the goal is to utilize Spawn-of-EnergyPlus for optimizing operational energy using machine learning or creating digital twins.

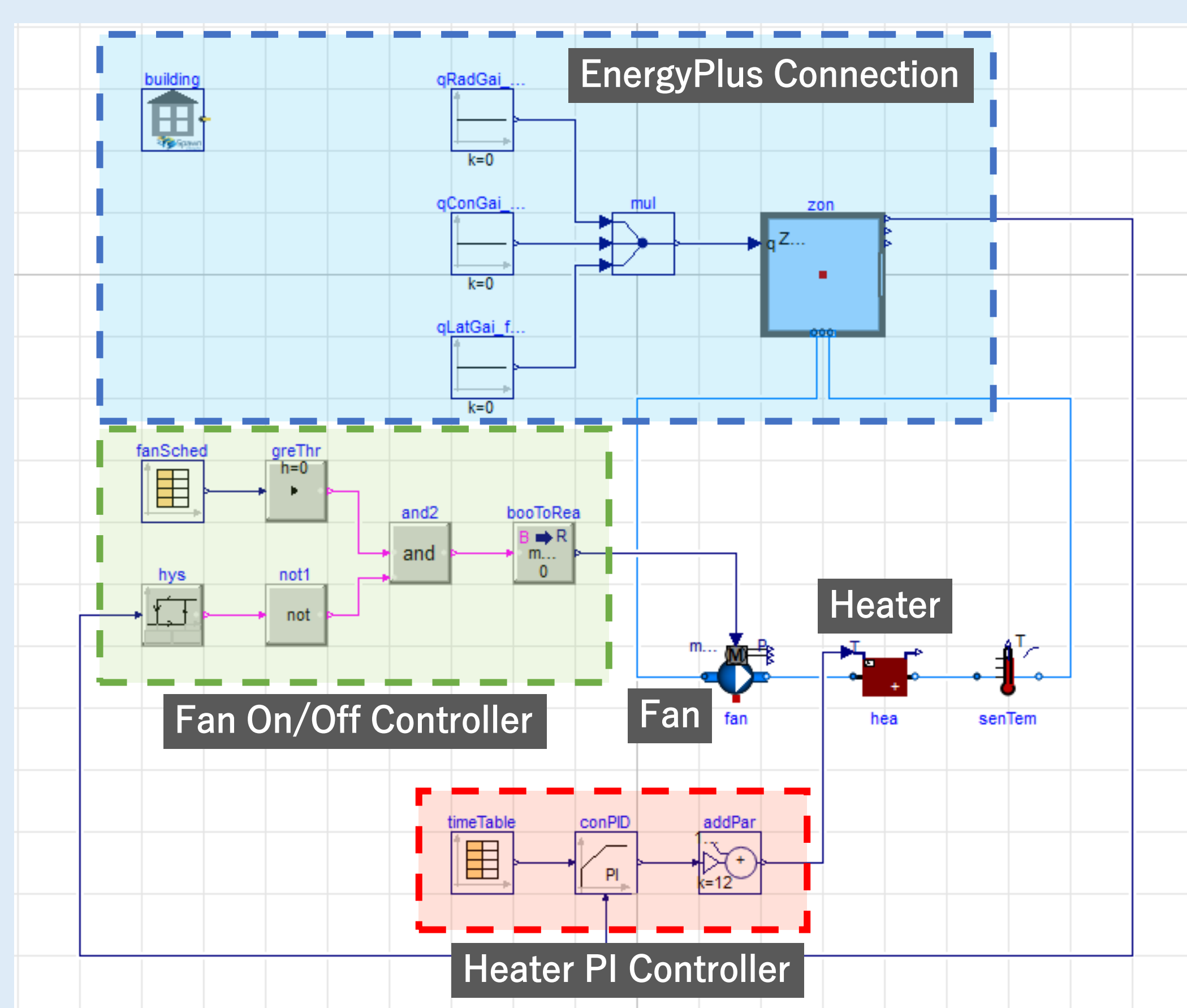
Spawn-of-EnergyPlus



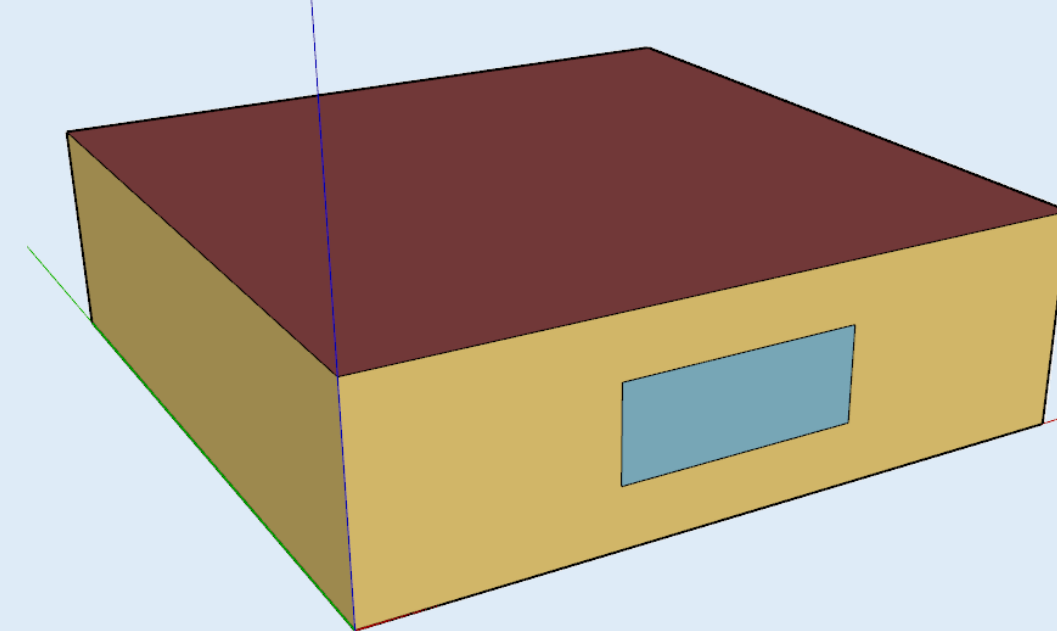
Overview: Spawn-of-EnergyPlus
Developed by US Department of Energy, Spawn-of-EnergyPlus allows the simulation of a more physically realistic simulation of systems compared to existing tools

Allows co-simulation between the load calculation from EnergyPlus and control system modeling from Modelica Buildings Library

Example HVAC Control Simulation

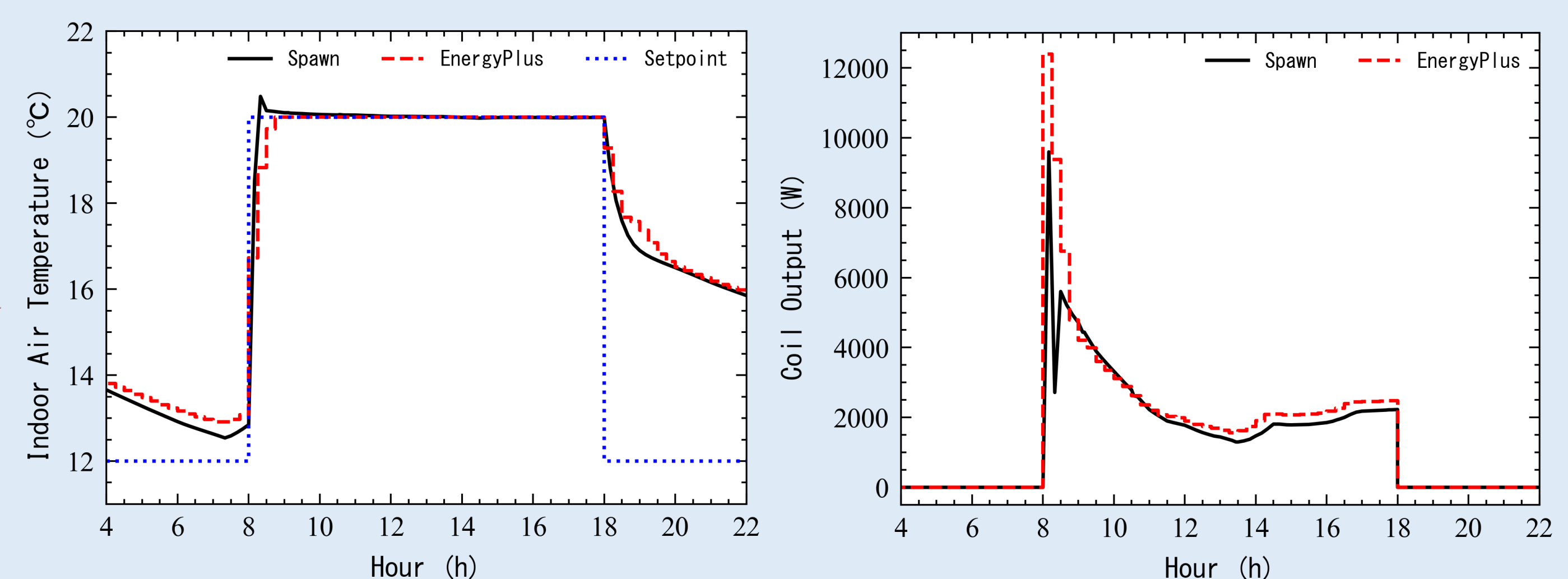


Modelica model with EnergyPlus connection



Building View

By comparing the results between Spawn-of-EnergyPlus and just EnergyPlus for a single room with a simple electric fan heater, we can see that Spawn-of-EnergyPlus was able to more realistically simulate a PI controller with faster reaction times.



Comparison of Results