

Development of a Modelica Model for the Texas A&M Smart and Connected Homes Testbed

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As Modelica grows in popularity among the research community, libraries are built and maintained by labs to further develop the software. Researchers at the Lawrence Berkeley National Laboratory (LBNL) have created an open-source library, the Modelica Buildings library, which enables researchers in the building science community to design and operate buildings and district energy and control systems (Wetter at al. 2014). This library contains dynamic simulation models for HVAC systems, energy storage, multi-zone airflow, and so much more. The contributions to this library come from many researchers among different institutions that aid in developing these tools for building research.

Buildings research is a growing field as the electrification of the grid and modern technology advancements enable the use of new smart home technologies. Whether it is smart thermostats, high-efficiency equipment, or even advanced building controls that are being researched, they all require a dependable model of the physical building to develop these complex fields. With the help of Modelica and the Modelica Buildings library, a flexible building model can be constructed while saving time in simulation-based projects.

The Buildings Energy and HVAC&R research group at Texas A&M University has a smart home testbed that will allow for the testing of smart home technologies, smart grid applications, and other residential building research topics. This paper will briefly go over the testbed before walking through the modeling using Modelica and the Modelica Buildings library. The paper will finish with individual model inspection. The future work of this project is to tune and verify the complete Modelica model performance using data taken at the testbed during operation.



Photo 1. The Texas A&M Smart and Connected Homes Testbed (TAM-SCHT)

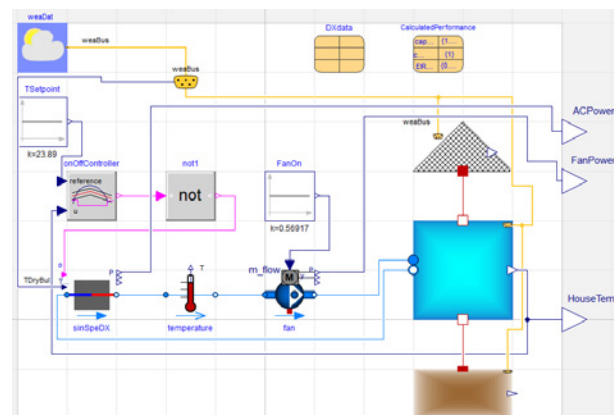


Figure 1. The complete Modelica model of TAM-SCHT, cooling only