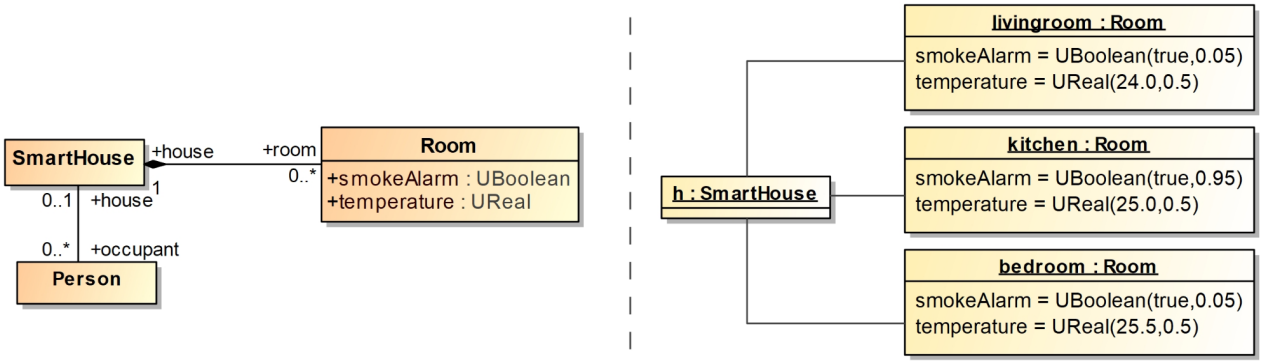
Exercise 1: Smart rooms - used to illustrate the use of the UML Profile

The goal of this exercise is to show the use of the BeliefUncertainty UML Profile and to check whether you are able to understand how to represent opinions in UML models, and what they mean. As part of this exercise, we will give you an introduction on how to use our UML Profile and we will ask you to fill in a Questionnaire.

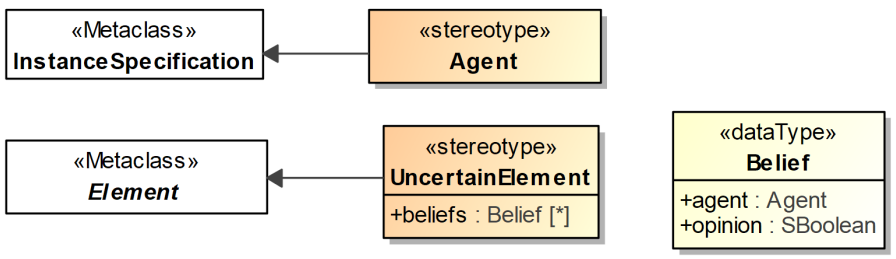
Let us suppose a smart house whose rooms are equipped with a temperature sensor and a smoke alarm. According to their manufacturers' information, the accuracy of the temperature sensor is ± 0.5 degrees and the reliability of the smoke alarm is 5%.

The diagrams below show the conceptual model of the system (left) and an object model that describes a house and three of its rooms (right). Note the use of the UML extended datatypes `UReal` and `UBoolean` that represent Real and Boolean values enriched with uncertainty [Bertoa et al, 2020].

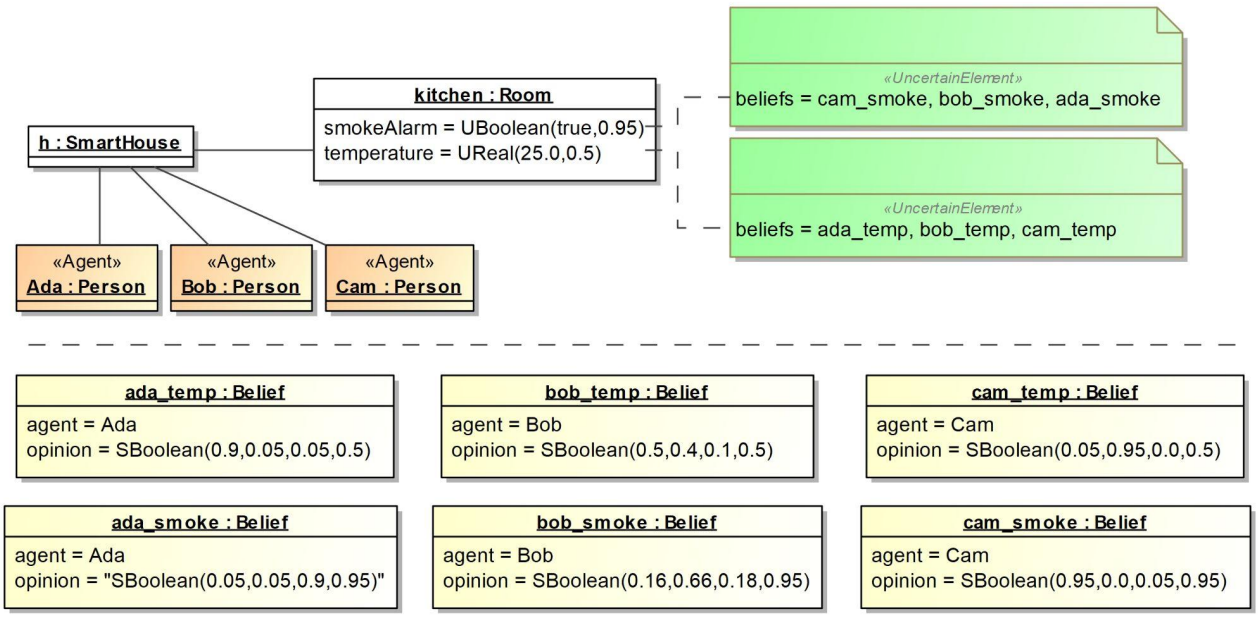


In many situations, the users of such systems also associate subjective uncertainty with that of the sources. For example, one of the house occupants, Ada, does not trust the temperature readings of the kitchen because he knows that the sensor is close to the oven and therefore the measurements can be fairly unreliable. So Ada would add some subjective uncertainty to the objective results of the sensor's measurements. Of course, this type of subjective uncertainty assigned to the same sensor by different users can vary, depending on their personal history, experiences, and beliefs (e.g., their individual level of trust in the manufacturer). Thus, other occupants may have different opinions, or trust, on the sensors' readings and consequently on their reactions to those, i.e., whether to think that there is a fire and hence call the fire brigade, or simply to ignore the alarm.

To add subjective opinions to the model elements we will use the Belief Uncertainty UML Profile, shown below. Stereotype `Agent` can be attached to users that can express opinions about the model elements. Stereotype `UncertainElement` is used to indicate that a model element is subject to the opinion of one or more agents, and it holds in its tag value `beliefs` the set of opinions by the agents, expressed as pairs (agent, opinion). Opinions are expressed by means of subjective logic binominal opinions.



Using this profile, an example of how to represent the opinions of the three house occupants (Ada, Bob and Cam) about the sensors in the **`kitchen`** room is shown in the following object diagram.



We can see how the three occupants have different subjective opinions on the values of the **`temperature`** and **`smokeAlarm`** slots of this object: Ada is quite confident in her opinions about the temperature readings but very uncertain about the smoke alarm. Bob is unsure about the temperature sensor and does not believe in the smoke alarm. Cam trusts in both devices.

Exercise 1A.

Once you have read this explanations and the example description, please respond to Questionnaire 1 available at https://forms.gle/dyDJHEUr6xbZS8sc9