Completing Z Specifications

November 8, 2023

TempMonitor

$$deployed \ : \ \mathbb{P}\ SENSOR\_TYPE$$
$$map : SENSOR\_TYPE \pfun LOCATION\_TYPE$$
$$read : SENSOR\_TYPE \pfun TEMPERATURE\_TYPE$$

$$deployed = \operatorname{dom} map$$
$$deployed = \operatorname{dom} read$$

ReplaceSensorOK

$$\Delta TempMonitor$$
$$location? : LOCATION\_TYPE$$
$$new\_sensor? : SENSOR\_TYPE$$

$$location? \in \operatorname{ran} map$$
$$new\_sensor? \notin deployed$$
$$deployed' = deployed \setminus \{map^{-1}(location?)\}$$
$$map' = \{map^{-1}(location?)\} \ndres map$$
$$map' = map \oplus \{new\_sensor? \mapsto location?\}$$

ReturnCollectionOK

$$\Xi TempMonitor$$
$$locations! \ : \ \mathbb{P}\ LOCATION\_TYPE$$
$$temperatures! \ : \ \mathbb{P}\ TEMPERATURE\_TYPE$$

$$locations! = \operatorname{ran} map$$
$$temperatures! = \operatorname{ran} read$$

$$ReplaceSensor \mathrel{\hat=} (ReplaceSensorOK \land Success) \oplus (LocationUnkown \lor SensorAlreadyDeployed)$$

$$ReturnAllTemperaturesAndLocations \mathrel{\hat=} ReturnCollectionOK$$

Based on the newly specified requirements, the following is the refined domain model for iteration 2.

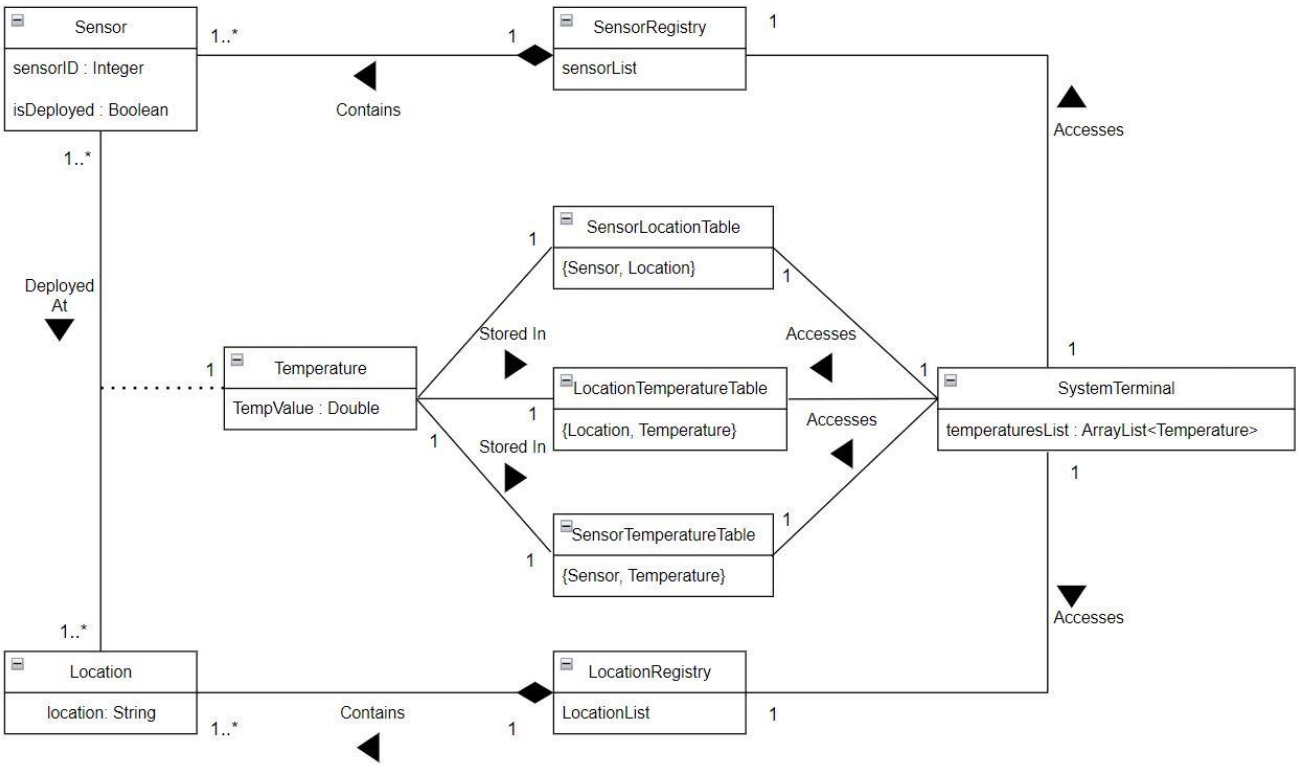

Figure 1: Domain Model - Updated for Iteration 2

Based on the given new requirements, we have extended the Z specification using LaTeX on the TeXstudio platform. We created 2 schemas *ReplaceSensorOK* and *ReturnCollectionOK* (see next page, along with the previously defined *TempMonitor* schema), which are used to define the two operations *ReplaceSensor* and *ReturnAllTemperaturesAndLocations*. Both of these new operations use the schemas already given in the first iteration.