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

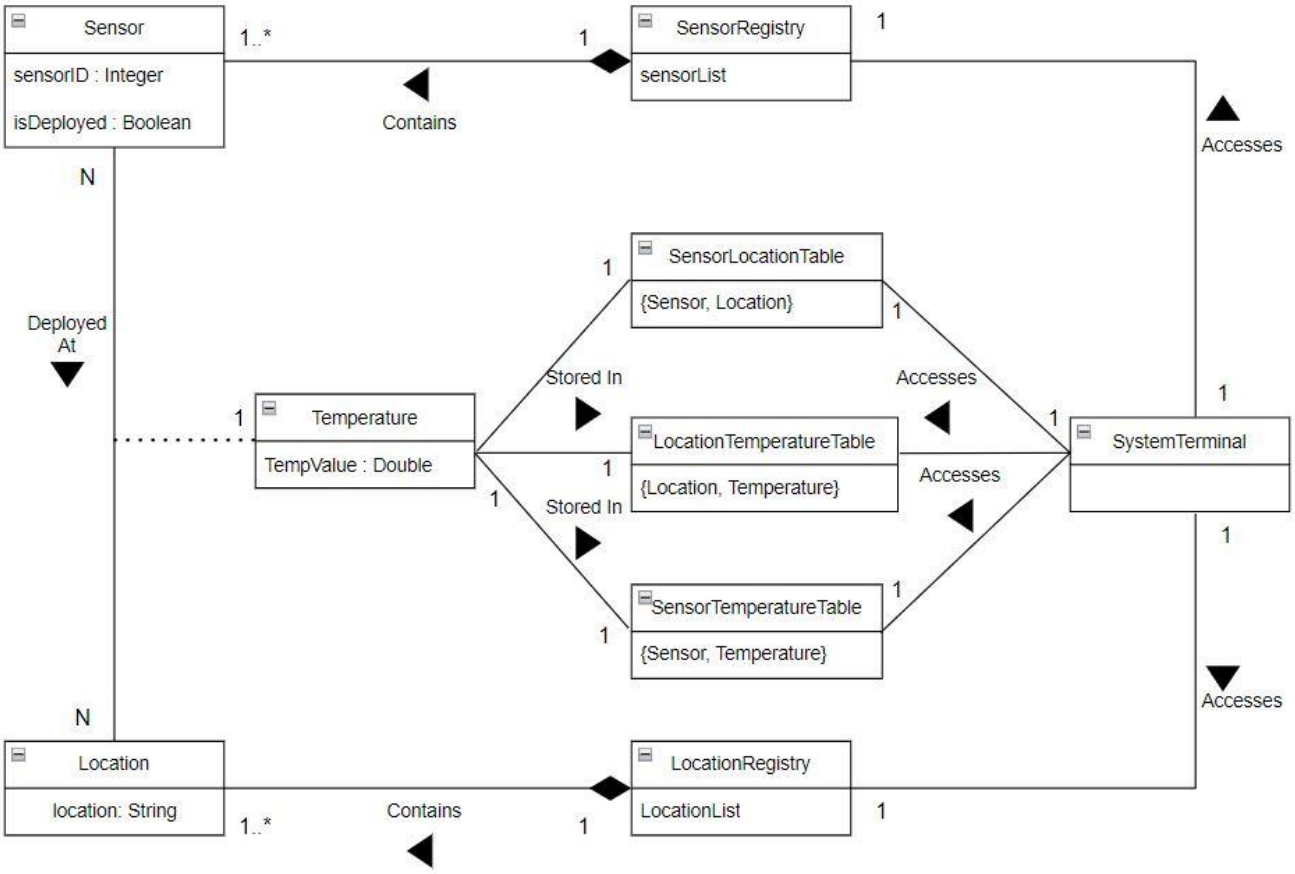

Figure 1: Domain Model - Updated for Iteration 2

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 *ReturnCollection*. Both of these new operations use the schemas already given in the first iteration.

Completing Z Specifications

November 1, 2023

TempMonitor

$$
\begin{array}{l}
deployed \ : \ \mathbb{P}\ SENSOR\_TYPE \\
map : SENSOR\_TYPE \pfun LOCATION\_TYPE \\
read : SENSOR\_TYPE \pfun TEMPERATURE\_TYPE \\
\hline
deployed = \mathrm{dom}\ map \\
deployed = \mathrm{dom}\ read
\end{array}
$$

ReplaceSensorOK

$$
\begin{array}{l}
\Delta TempMonitor \\
location? : LOCATION\_TYPE \\
new\_sensor? : SENSOR\_TYPE \\
\hline
new\_sensor? \notin deployed \\
deployed' = deployed \setminus \{map^{-1}(location?)\} \\
map' = \{map^{-1}(location?)\} \rhd map \\
map' = map \oplus \{new\_sensor? \mapsto location?\}
\end{array}
$$

ReturnCollectionOK

$$
\begin{array}{l}
\Xi TempMonitor \\
locations! \ : \ \mathbb{P}\ LOCATION\_TYPE \\
temperatures! \ : \ \mathbb{P}\ TEMPERATURE\_TYPE \\
\hline
locations! = \mathrm{ran}\ map \\
temperatures! = \mathrm{ran}\ read
\end{array}
$$

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

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