SOEN 342 - Sections II

Software Requirements and Specifications

Project

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1 Formal specification in Z

The formal specification of the system introduces the following three types:

$$SENSOR\_TYPE, LOCATION\_TYPE, TEMPERATURE\_TYPE$$

The system's (partial) formal specification is given in the Z language and it consists of schemas and the definitions of operations that constitute the system's exposed interface.

1.1 Schemas and Operations given in the project

TempMonitor

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

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

DeploySensorOK

$$\Delta TempMonitor$$
$$sensor? : SENSOR\_TYPE$$
$$location? : LOCATION\_TYPE$$
$$temperature? : TEMPERATURE\_TYPE$$

$$sensor? \notin deployed$$
$$location? \notin \mathrm{ran}\ map$$
$$deployed' = deployed \cup \{sensor?\}$$
$$map' = map \cup \{sensor? \mapsto location?\}$$
$$read' = read \cup \{sensor? \mapsto temperature?\}$$

ReadTemperatureOK

$$\Xi TempMonitor$$
$$location? : LOCATION\_TYPE$$
$$temperature! : TEMPERATURE\_TYPE$$

$$location? \in \mathrm{ran}\ map$$
$$temperature! = read(map^{-1}(location?))$$

Success

$\Xi TempMonitor$
$response! : MESSAGE$

$response! = 'ok'$

SensorAlreadyDeployed

$\Xi TempMonitor$
$sensor? : SENSOR\_TYPE$
$response! : MESSAGE$

$sensor? \in deployed$
$response! = 'Sensor\ deployed'$

LocationAlreadyCovered

$\Xi TempMonitor$
$location? : LOCATION\_TYPE$
$response! : MESSAGE$

$location? \in \operatorname{ran} map$
$response! = 'Location\ already\ covered'$

LocationUnknown

$\Xi TempMonitor$
$location? : LOCATION\_TYPE$
$response! : MESSAGE$

$location? \notin \operatorname{ran} map$
$response! = 'Location\ not\ covered'$

$$DeploySensor \mathrel{\hat=} (DeploySensorOK \land Success) \oplus (SensorAlreadyDeployed \lor LocationAlreadyCovered)$$

$$ReadTemperature \mathrel{\hat=} (ReadTemperatureOK \land Success) \oplus LocationUnknown$$

1.2 Added Schemas and Operations to Formal Specifications

MoveToNewLocationOK

$\Delta TempMonitor$
$sensor? : SENSOR\_TYPE$
$location? : LOCATION\_TYPE$

$sensor? \in deployed$
$location? \notin \operatorname{ran} map$
$map' = map \oplus \{sensor? \mapsto location?\}$

SensorNotDeployed

$\Xi TempMonitor$
$sensor? : SENSOR\_TYPE$
$response! : MESSAGE$

$sensor? \notin deployed$
$response! = 'Sensor\ not\ deployed'$

LocationAlreadyOccupied

$\Xi TempMonitor$
$location? : LOCATION\_TYPE$
$response! : MESSAGE$

$location? \in \operatorname{ran} map$
$response! = 'Location\ already\ occupied'$

GetLocationOK

$\Xi TempMonitor$
$sensor? : SENSOR\_TYPE$
$locations! : LOCATION\_TYPE$

$sensor? \in deployed$
$locations! = map(sensor?)$

GetAllLocationsOK

$\Xi TempMonitor$
$locations! : LOCATION\_TYPE$

$locations! \in \operatorname{ran} map$

UndeploySensorOK

$\Delta TempMonitor$
$sensor? : SENSOR\_TYPE$

$sensor? \in deployed$
$deployed' = deployed \setminus \{sensor?\}$
$map' = \{sensor?\} \lhd map$
$read' = \{sensor?\} \lhd read$

$$UndeploySensor \mathrel{\hat{=}} (UndeploySensorOK \land Success) \oplus SensorNotDeployed$$

$$MoveToNewLocation \mathrel{\hat{=}} (MoveToNewLocationOK \land Success) \ \oplus (SensorNotDeployed \lor LocationAlreadyOccupied)$$

$$GetLocation \mathrel{\hat{=}} (GetLocationOK \land Success) \oplus SensorNotDeployed$$

$$GetAllLocations \mathrel{\hat{=}} GetAllLocationsOK$$