SOEN331: Introduction to Formal Methods for Software Engineering

Assignment 2 on Object-Z specification

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1 Map

[Description, Coordinate]

Point == Coordinate $\times$ Coordinate

$Message ::= ok \mid location\_already\_known \mid no\_location\_found$

to┌─ Map

┌─────────────────────────────
$locations : Description \nrightarrow Point$
└─────────────────────────────

$\uparrow (AddLocation, DeleteLocation, ModifyLocation, FindLocation)$

to┌$INIT$locations $= \{\}$

─────────────────────────────

┌─ $AddLocationOK$ ─────────────────────
$\Delta(locations)$
$newDescription? : Description$
$newPoint? : Point$
├─────────────────────────
$newDescription? \notin dom\ locations$
$locations' = locations \cup \{newDescription? \rightarrow newPoint?\}$
└─────────────────────────────

┌─ $DeleteLocationOK$ ─────────────────────
$\Delta(locations)$
$location? : locations$
├─────────────────────────
$location? \in\ locations$
$locations' = locations \setminus \{location?\}$
└─────────────────────────────

___ *ModifyLocationOK* _____

$\Delta(locations)$
$desc? : Description$
$newPoint? : Point$

―――――――――――――――

$desc? \in dom\ locations$
$locations' = locations \oplus \{desc? \rightarrow newPoint?\}$

_____

___ *FindLocationOK* _____

$\Xi(locations)$
$desc? : Description$
$point! : Point$

―――――――――――――――

$desc? \in\ dom\ locations$
$point! = locations(desc?)$

_____

___ *Success* _____

$\Xi(locations)$
$result! : Message$

―――――――――――――――

$result! = ok$

_____

___ *LocationAlreadyKnown* _____

$\Xi(locations)$
$description? : Description$
$result! : Message$

―――――――――――――――

$description? \in dom\ locations$
$result! = location\_already\_known$

_____

___ *NoLocationFound* _____

$\Xi(locations)$
$description? : Description$
$result! : Message$

―――――――――――――――

$description? \notin dom\ locations$
$result! = no\_location\_found$

_____

$AddLocation \;\triangleq\; (AddLocationOk \land Sucess) \lor LocationAlreadyKnown$

$DeleteLocation \;\triangleq\; (DeleteLocationOK \land Sucess) \lor NoLocationFound$

$ModifyLocation \;\triangleq\; (ModifyLocationOK \land Sucess) \lor NoLocationFound$

$FindLocation \;\triangleq\; (FindLocationOK \land Sucess) \lor NoLocationFound$

Map2

Map

$count : \mathbb{N}$

$count >= 0$

INIT

$count = 0$

AddLocationOK

$\Delta(count)$

$count' = count + 1$

DeleteLocationOK

$\Delta(count)$

$count' = count - 1$

ModifyLocationOK

$count' = count$

FindLocationOK

$count' = count$

Success

$count' = count$

LocationAlreadyKnown

$count' = count$

NoLocationFound

$count' = count$