$\qquad\qquad$ MODULE $UML5$ $\qquad\qquad$

EXTENDS $Naturals$
VARIABLES $broadcastInfo$, $forwardToDB$, $updateInfoInDB$, $tagStatus$, $alertTag$, $alertReader$, $currentBattery$, r

$TypeOK \triangleq$
$\qquad \wedge \quad broadcastInfo \in \{\text{"done"}, \text{"notDone"}\}$
$\qquad \wedge \quad forwardToDB \in \{\text{"done"}, \text{"notDone"}\}$
$\qquad \wedge \quad updateInfoInDB \in \{\text{"done"}, \text{"notDone"}\}$
$\qquad \wedge \quad tagStatus \in \{\text{"active"}, \text{"inactive"}\}$
$\qquad \wedge \quad alertTag \in \{\text{"required"}, \text{"notRequired"}\}$
$\qquad \wedge \quad alertReader \in \{\text{"required"}, \text{"notRequired"}\}$
$\qquad \wedge \quad currentBattery \in (1 \mathinner{\ldotp\ldotp} 100)$
$\qquad \wedge \quad readerStatus \in \{\text{"active"}, \text{"inactive"}\}$
$\qquad \wedge \quad contactInactiveReaders \in \{\text{"required"}, \text{"notRequired"}\}$
$\qquad \wedge \quad ack \in \{\text{"received"}, \text{"notReceived"}, \text{"notRequired"}\}$

$Init \triangleq$
$\qquad \wedge broadcastInfo = \text{"notDone"}$
$\qquad \wedge forwardToDB = \text{"notDone"}$
$\qquad \wedge updateInfoInDB = \text{"notDone"}$
$\qquad \wedge tagStatus = \text{"active"}$
$\qquad \wedge alertTag = \text{"notRequired"}$
$\qquad \wedge alertReader = \text{"notRequired"}$
$\qquad \wedge currentBattery \in (1 \mathinner{\ldotp\ldotp} 100)$
$\qquad \wedge readerStatus = \text{"active"}$
$\qquad \wedge contactInactiveReaders = \text{"notRequired"}$
$\qquad \wedge ack = \text{"notRequired"}$

$Var \triangleq \langle broadcastInfo, forwardToDB, updateInfoInDB, tagStatus, alertTag, alertReader, currentBattery, rea$

$UpdateStatus \triangleq$
$\qquad \vee \quad \wedge broadcastInfo = \text{"notDone"}$
$\qquad\qquad \wedge broadcastInfo' = \text{"done"}$
$\qquad\qquad \wedge \text{UNCHANGED } \langle forwardToDB, updateInfoInDB, tagStatus, currentBattery, readerStatus \rangle$
$\qquad \vee \quad \wedge broadcastInfo = \text{"done"}$
$\qquad\qquad \wedge forwardToDB = \text{"notDone"}$
$\qquad\qquad \wedge forwardToDB' = \text{"done"}$
$\qquad\qquad \wedge \text{UNCHANGED } \langle broadcastInfo, updateInfoInDB, tagStatus, currentBattery, readerStatus \rangle$
$\qquad \vee \quad \wedge broadcastInfo = \text{"done"}$
$\qquad\qquad \wedge forwardToDB = \text{"done"}$
$\qquad\qquad \wedge updateInfoInDB = \text{"notDone"}$
$\qquad\qquad \wedge updateInfoInDB' = \text{"done"}$
$\qquad\qquad \wedge tagStatus' \in \{\text{"active"}, \text{"inactive"}\}$
$\qquad\qquad \wedge currentBattery' \in (1 \mathinner{\ldotp\ldotp} 100)$
$\qquad\qquad \wedge readerStatus' \in \{\text{"active"}, \text{"inactive"}\}$
$\qquad\qquad \wedge \text{UNCHANGED } \langle broadcastInfo, forwardToDB \rangle$

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$$\lor \quad \land broadcastInfo = \text{``done''}$$
$$\land forwardToDB = \text{``done''}$$
$$\land updateInfoInDB = \text{``done''}$$
$$\land \text{UNCHANGED } \langle broadcastInfo, forwardToDB, updateInfoInDB \rangle$$

$CheckTagStatus \triangleq$
$\quad \lor \quad \land updateInfoInDB = \text{``done''}$
$\quad\quad \land tagStatus = \text{``inactive''}$
$\quad\quad \land currentBattery \geq 10$
$\quad\quad \land alertTag' = \text{``required''}$
$\quad\quad \land tagStatus' = \text{``active''}$
$\quad\quad \land \text{UNCHANGED } \langle currentBattery \rangle$
$\quad \lor \quad \land updateInfoInDB = \text{``done''}$
$\quad\quad \land tagStatus = \text{``active''}$
$\quad\quad \land currentBattery < 10$
$\quad\quad \land alertTag' = \text{``required''}$
$\quad\quad \land currentBattery' \in (10 \mathinner{\ldotp\ldotp} 100)$
$\quad\quad \land \text{UNCHANGED } \langle tagStatus \rangle$
$\quad \lor \quad \land updateInfoInDB = \text{``done''}$
$\quad\quad \land tagStatus = \text{``inactive''}$
$\quad\quad \land currentBattery < 10$
$\quad\quad \land alertTag' = \text{``required''}$
$\quad\quad \land tagStatus' = \text{``active''}$
$\quad\quad \land currentBattery' \in (10 \mathinner{\ldotp\ldotp} 100)$
$\quad \lor \quad \land updateInfoInDB = \text{``done''}$
$\quad\quad \land currentBattery \geq 10$
$\quad\quad \land tagStatus = \text{``active''}$
$\quad\quad \land \text{UNCHANGED } \langle alertTag, tagStatus, currentBattery \rangle$
$\quad \lor \quad \land updateInfoInDB = \text{``notDone''}$
$\quad\quad \land \text{UNCHANGED } \langle alertTag \rangle$

$CheckReaderStatus \triangleq$
$\quad \lor \quad \land updateInfoInDB = \text{``done''}$
$\quad\quad \land readerStatus = \text{``inactive''}$
$\quad\quad \land contactInactiveReaders = \text{``notRequired''}$
$\quad\quad \land contactInactiveReaders' = \text{``required''}$
$\quad\quad \land \text{UNCHANGED } \langle ack, readerStatus, alertReader \rangle$
$\quad \lor \quad \land updateInfoInDB = \text{``done''}$
$\quad\quad \land contactInactiveReaders = \text{``required''}$
$\quad\quad \land ack = \text{``notRequired''}$
$\quad\quad \land ack' \in \{\text{``received''}, \text{``notReceived''}\}$
$\quad\quad \land \text{UNCHANGED } \langle contactInactiveReaders, readerStatus, alertReader \rangle$
$\quad \lor \quad \land updateInfoInDB = \text{``done''}$
$\quad\quad \land contactInactiveReaders = \text{``required''}$
$\quad\quad \land ack = \text{``received''}$

$\qquad \land contactInactiveReaders' = \text{``notRequired''}$
$\qquad \land ack' = \text{``notRequired''}$
$\qquad \land readerStatus' = \text{``active''}$
$\qquad \land \textsc{unchanged} \ \langle alertReader \rangle$
$\quad \lor \ \land updateInfoInDB = \text{``done''}$
$\qquad \land contactInactiveReaders = \text{``required''}$
$\qquad \land ack = \text{``notReceived''}$
$\qquad \land alertReader' = \text{``required''}$
$\qquad \land contactInactiveReaders' = \text{``notRequired''}$
$\qquad \land ack' = \text{``notRequired''}$
$\qquad \land readerStatus' = \text{``active''}$
$\quad \lor \ \land updateInfoInDB = \text{``done''}$
$\qquad \land readerStatus = \text{``active''}$
$\qquad \land \textsc{unchanged} \ \langle contactInactiveReaders, \ ack, \ readerStatus, \ alertReader \rangle$
$\quad \lor \ \land updateInfoInDB = \text{``notDone''}$
$\qquad \land \textsc{unchanged} \ \langle alertReader, \ ack, \ contactInactiveReaders \rangle$

$Next \ \triangleq$
$\quad \land UpdateStatus$
$\quad \land CheckTagStatus$
$\quad \land CheckReaderStatus$
$\quad \land TypeOK$

$Spec \ \triangleq \ Init \land \Box [Next]_{Var}$