
MODULE *paxos*

EXTENDS *Integers*

$Maximum(S) \triangleq$
 Probably a bit mind breaking than it needs to be
 Essentially takes the maximum in the set S
 LET $Max[T \in \text{SUBSET } S] \triangleq$
 IF $T = \{\}$ THEN -1
 ELSE LET $n \triangleq \text{CHOOSE } n \in T : \text{TRUE}$
 $rmax \triangleq Max[T \setminus \{n\}]$
 IN IF $n \geq rmax$ THEN n ELSE $rmax$
 IN $Max[S]$

CONSTANT $RM, Acceptor, Majority, Ballot$

ASSUME
 $\wedge Ballot \subseteq Nat$
 $\wedge 0 \in Ballot$
 $\wedge Majority \subseteq \text{SUBSET } Acceptor$
 $\wedge \forall MS1, MS2 \in Majority : MS1 \cap MS2 \neq \{\}$

$Messages \triangleq$
 $[type : \{\text{"phase1a"}\}, ins : RM, bal : Ballot \setminus \{0\}]$
 \cup
 $[type : \{\text{"phase1b"}\}, ins : RM, mbal : Ballot, bal : Ballot \cup \{-1\}, val : \{\text{"prepared"}, \text{"aborted"}, \text{"none"}\}, acc : Acceptor]$
 \cup
 $[type : \{\text{"phase2a"}\}, ins : RM, bal : Ballot, val : \{\text{"prepared"}, \text{"aborted"}, \text{"none"}\}]$
 \cup
 $[type : \{\text{"phase2b"}\}, acc : Acceptor, ins : RM, bal : Ballot, val : \{\text{"prepared"}, \text{"aborted"}\}]$
 \cup
 $[type : \{\text{"Commit"}, \text{"Abort"}\}]$

VARIABLES $rmState, aState, msgs$

$PCTypeOk \triangleq$
 $\wedge rmState \in [RM \rightarrow \{\text{"working"}, \text{"prepared"}, \text{"committed"}, \text{"aborted"}\}]$
 $\wedge aState \in [RM \rightarrow [Acceptor \rightarrow [mbal : Ballot,$
 $bal : Ballot \cup \{-1\},$
 $val : \{\text{"prepared"}, \text{"aborted"}, \text{"none"}\}]]]$
 $\wedge msgs \subseteq Messages$

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