
MODULE *CRDTCounter*

LOCAL INSTANCE *Naturals*

LOCAL INSTANCE *TLC*

CONSTANT *Nodes*

CONSTANT *IncrementRequest*,
IncrementResponse,
GetRequest,
GetResponse,
LookupRequest,
LookupResponse

VARIABLE *messages*

VARIABLE *requests*

VARIABLE *count*

LOCAL *Messaging* \triangleq INSTANCE *Messaging*

SendIncrementRequest(*n*) \triangleq
 \wedge *Messaging*! *Send*([*type* \mapsto *IncrementRequest*, *dst* \mapsto *n*])
 \wedge UNCHANGED \langle *requests*, *count* \rangle

HandleIncrementRequest(*n*, *m*) \triangleq
 \wedge *Messaging*! *Receive*(*m*)
 \wedge *count*' = [*count* EXCEPT ![*n*] = *count*[*n*] + 1]
 \wedge *Messaging*! *Reply*([*type* \mapsto *IncrementResponse*, *count* \mapsto *count*'[*n*]])
 \wedge UNCHANGED \langle *requests* \rangle

HandleIncrementResponse(*m*) \triangleq
 \wedge *Messaging*! *Receive*(*m*)
 \wedge UNCHANGED \langle *count* \rangle

HandleGetRequest(*n*, *m*) \triangleq
 \wedge *Messaging*! *Receive*(*m*)
 \wedge $\forall o \in \text{Nodes} : \text{Messaging!Reply}([type \mapsto \text{LookupRequest}, src \mapsto n, dst \mapsto o, req \mapsto m])$
 \wedge *requests*' = *requests* @@ (*m* :> {})
 \wedge UNCHANGED \langle *count* \rangle

HandleGetResponse(*m*) \triangleq
 \wedge *Messaging*! *Receive*(*m*)
 \wedge UNCHANGED \langle *count* \rangle

HandleLookupRequest(*n*, *m*) \triangleq

$\wedge \text{Messaging!Receive}(m)$
 $\wedge \text{Messaging!Reply}([type \mapsto \text{LookupResponse}, count \mapsto count[n], src \mapsto n, dst \mapsto m.src, req \mapsto m.req])$
 $\wedge \text{UNCHANGED } \langle requests, count \rangle$

$\text{HandleLookupResponse}(n, m) \triangleq$
 $\wedge \text{Messaging!Receive}(m)$
 $\wedge \vee \wedge m.req \in requests$
 $\quad \wedge requests' = [requests \text{ EXCEPT } ![m.req] = requests[m.req] \cup \{m\}]$
 $\vee \wedge m.req \notin requests$
 $\quad \wedge \text{UNCHANGED } \langle requests \rangle$
 $\wedge \text{UNCHANGED } \langle count \rangle$

$\text{HandleMessage}(m) \triangleq$
 $\vee \wedge m.type = \text{IncrementRequest}$
 $\quad \wedge \text{HandleIncrementRequest}(m.dst, m)$
 $\vee \wedge m.type = \text{IncrementResponse}$
 $\quad \wedge \text{HandleIncrementResponse}(m)$
 $\vee \wedge m.type = \text{GetRequest}$
 $\quad \wedge \text{HandleGetRequest}(m.dst, m)$
 $\vee \wedge m.type = \text{GetResponse}$
 $\quad \wedge \text{HandleGetResponse}(m)$
 $\vee \wedge m.type = \text{LookupRequest}$
 $\quad \wedge \text{HandleLookupRequest}(m.dst, m)$
 $\vee \wedge m.type = \text{LookupResponse}$
 $\quad \wedge \text{HandleLookupResponse}(m.dst, m)$

$\text{Init} \triangleq$
 $\wedge messages = [m \in \{\} \mapsto 0]$
 $\wedge requests = [m \in \{\} \mapsto \{\}]$
 $\wedge count = [n \in Nodes \mapsto 0]$

$\text{Next} \triangleq$
 $\vee \text{Messaging!Handle}(\text{HandleMessage})$

\backslash * Modification History
 \backslash * Last modified Mon Sep 13 16:40:46 PDT 2021 by jordanhalterman
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