

MODULE <i>StateCounter</i>	
EXTENDS <i>Naturals, Sequences, Bags, TLC, SEC</i>	
<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>VARIABLES</p> <p><i>counter</i>,</p> <p><i>sendAllowed</i>,</p> <p><i>seq</i>,</p> <p><i>incoming</i>,</p> <p><i>msg</i>,</p> <p><i>messageSet</i></p> </div> <div style="width: 65%;"> <p><i>counter</i>[<i>r</i>][<i>s</i>]: current value of the <i>Replica</i>[<i>s</i>] at <i>replica</i>[<i>r</i>]</p> <p><i>sendAllowed</i>[<i>r</i>]: is the replica $r \in \text{Replica}$ allowed to send a message</p> <p><i>seq</i>[<i>r</i>]: local sequence number at replica $r \in \text{Replica}$</p> <p>network variable</p> <p>network variable</p> <p>network variable</p> </div> </div>	
<p>$\text{vars} \triangleq \langle \text{counter}, \text{sendAllowed}, \text{seq}, \text{incoming}, \text{msg}, \text{messageSet}, \text{SECvars} \rangle$</p>	
<p>$\text{Vector} \triangleq [\text{Replica} \rightarrow \text{Nat}]$</p> <p>$\text{InitVector} \triangleq [r \in \text{Replica} \mapsto 0]$</p> <p>$\text{InitCounter} \triangleq \text{counter} = [r \in \text{Replica} \mapsto \text{InitVector}]$</p> <p>$\text{Msg} \triangleq [r : \text{Replica}, \text{buf} : \text{Vector}, \text{seq} : \text{Nat}, \text{update} : \text{SUBSET } \text{Update}]$</p>	
<p>$\text{Network} \triangleq \text{INSTANCE } \text{Network}$</p>	
<p>$\text{TypeOK} \triangleq$</p> <p style="padding-left: 20px;">$\wedge \text{counter} \in [\text{Replica} \rightarrow \text{Vector}]$</p> <p style="padding-left: 20px;">$\wedge \text{sendAllowed} \in [\text{Replica} \rightarrow \{0, 1\}]$</p>	
<p>$\text{Init} \triangleq$</p> <p style="padding-left: 20px;">$\wedge \text{InitCounter}$</p> <p style="padding-left: 20px;">$\wedge \text{sendAllowed} = [r \in \text{Replica} \mapsto 0]$</p> <p style="padding-left: 20px;">$\wedge \text{seq} = [r \in \text{Replica} \mapsto 0]$</p> <p style="padding-left: 20px;">$\wedge \text{Network!NInit}$</p> <p style="padding-left: 20px;">$\wedge \text{SECInit}$</p>	
<p>$\text{Inc}(r) \triangleq$</p> <p style="padding-left: 20px;">$\wedge \text{counter}' = [\text{counter} \text{ EXCEPT } ![r][r] = @ + 1]$</p> <p style="padding-left: 20px;">$\wedge \text{sendAllowed}' = [\text{sendAllowed} \text{ EXCEPT } ![r] = 1]$</p> <p style="padding-left: 20px;">$\wedge \text{seq}' = [\text{seq} \text{ EXCEPT } ![r] = @ + 1]$</p> <p style="padding-left: 20px;">$\wedge \text{SECUpdate}(r, \text{seq}[r])$</p> <p style="padding-left: 20px;">$\wedge \text{UNCHANGED } \langle \text{incoming}, \text{msg}, \text{messageSet} \rangle$</p>	
<p>$\text{Send}(r) \triangleq$</p> <p style="padding-left: 20px;">$\wedge \text{sendAllowed}' = [\text{sendAllowed} \text{ EXCEPT } ![r] = 0]$</p> <p style="padding-left: 20px;">$\wedge \text{Network!NBroadcast}(r, [r \mapsto r, \text{buf} \mapsto \text{counter}[r], \text{seq} \mapsto \text{seq}[r],$</p> <p style="padding-left: 40px;">$\text{update} \mapsto \text{StateUpdate}(r)])$</p> <p style="padding-left: 20px;">$\wedge \text{SECSend}(r)$</p> <p style="padding-left: 20px;">$\wedge \text{UNCHANGED } \langle \text{counter}, \text{seq} \rangle$</p>	
<p>$\text{SetMax}(r, s) \triangleq \text{IF } r > s \text{ THEN } r \text{ ELSE } s$</p>	

$$\begin{array}{l}
\textit{Receive}(r) \triangleq \\
\quad \wedge \textit{Network!N Deliver}(r) \\
\quad \wedge \textit{SECDeliver}(r, \textit{msg}'[r]) \\
\quad \wedge \forall s \in \textit{Replica} : \\
\qquad \textit{counter}' = [\textit{counter} \text{ EXCEPT } ![r][s] = \textit{SetMax}(@, \textit{msg}'[r].\textit{buf}[s])] \\
\quad \wedge \text{UNCHANGED } \langle \textit{sendAllowed}, \textit{seq} \rangle \\
\hline
\textit{Next} \triangleq \quad \wedge \exists r \in \textit{Replica} : \textit{Inc}(r) \vee \textit{Send}(r) \vee \textit{Receive}(r) \\
\hline
\textit{Spec} \triangleq \textit{Init} \wedge \Box[\textit{Next}]_{\textit{vars}} \\
\hline
\textit{Read}(r) \triangleq \textit{counter}[r] \\
\textit{SEC} \triangleq \exists r1, r2 \in \textit{Replica} : \textit{SameUpdate}(r1, r2) \Rightarrow \textit{Read}(r1) = \textit{Read}(r2) \\
\hline
\end{array}$$

\ * Modification History
\ * Last modified *Thu* May 16 09:34:24 *CST* 2019 by *zfwang*
\ * Last modified *Mon* May 06 15:54:02 *CST* 2019 by *jywellin*
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