MODULE *OneBit2Procs*

EXTENDS *Integers*

```
**************************************************************************
--algorithm OneBit{
   variable x = [i    ∈ {0, 1} ↦ FALSE] ;
   fair process ( P ∈ {0, 1} )
    { ncs: while ( TRUE )
              {       skip ;
                e1:   x[self] := TRUE ;
                e2:   if ( ¬x[1 − self] ) { cs: skip }
                      else { if ( self = 0 ) { goto e2 }
                             else { e3: x[1] := FALSE ;
                                    e4: while ( x[0] ) { skip } ;
                                        goto e1
                                  }
                           } ;
                f:    x[self] := FALSE
              }
    }
 }
**************************************************************************
```

BEGIN TRANSLATION

VARIABLES x, pc

$vars \triangleq \langle x, pc \rangle$

$ProcSet \triangleq (\{0, 1\})$

$Init \triangleq$ Global variables
$\land\ x = [i \in \{0, 1\} \mapsto \text{FALSE}]$
$\land\ pc = [self \in ProcSet \mapsto \text{“ncs”}]$

$ncs(self) \triangleq \land\ pc[self] = \text{“ncs”}$
$\land\ \text{TRUE}$
$\land\ pc' = [pc \text{ EXCEPT } ![self] = \text{“e1”}]$
$\land\ x' = x$

$e1(self) \triangleq \land\ pc[self] = \text{“e1”}$
$\land\ x' = [x \text{ EXCEPT } ![self] = \text{TRUE}]$
$\land\ pc' = [pc \text{ EXCEPT } ![self] = \text{“e2”}]$

$e2(self) \triangleq \land\ pc[self] = \text{“e2”}$
$\land\ \text{IF } \neg x[1 - self]$
$\text{THEN } \land\ pc' = [pc \text{ EXCEPT } ![self] = \text{“cs”}]$
$\text{ELSE } \land\ \text{IF } self = 0$
$\text{THEN } \land\ pc' = [pc \text{ EXCEPT } ![self] = \text{“e2”}]$

$$\begin{array}{l}
\qquad\qquad\qquad\qquad\qquad\qquad \text{ELSE} \quad \land\, pc' = [pc \text{ EXCEPT } ![self] = \text{“e3”}] \\
\qquad \land\, x' = x \\
\\
cs(self) \triangleq \land\, pc[self] = \text{“cs”} \\
\qquad\quad \land\, \text{TRUE} \\
\qquad\quad \land\, pc' = [pc \text{ EXCEPT } ![self] = \text{“f”}] \\
\qquad\quad \land\, x' = x \\
\\
e3(self) \triangleq \land\, pc[self] = \text{“e3”} \\
\qquad\quad \land\, x' = [x \text{ EXCEPT } ![1] = \text{FALSE}] \\
\qquad\quad \land\, pc' = [pc \text{ EXCEPT } ![self] = \text{“e4”}] \\
\\
e4(self) \triangleq \land\, pc[self] = \text{“e4”} \\
\qquad\quad \land\, \text{IF } x[0] \\
\qquad\qquad\quad \text{THEN} \quad \land\, \text{TRUE} \\
\qquad\qquad\qquad\qquad\quad \land\, pc' = [pc \text{ EXCEPT } ![self] = \text{“e4”}] \\
\qquad\qquad\quad \text{ELSE} \quad \land\, pc' = [pc \text{ EXCEPT } ![self] = \text{“e1”}] \\
\qquad\quad \land\, x' = x \\
\\
f(self) \triangleq \land\, pc[self] = \text{“f”} \\
\qquad\quad \land\, x' = [x \text{ EXCEPT } ![self] = \text{FALSE}] \\
\qquad\quad \land\, pc' = [pc \text{ EXCEPT } ![self] = \text{“ncs”}] \\
\\
P(self) \triangleq ncs(self) \lor e1(self) \lor e2(self) \lor cs(self) \lor e3(self) \\
\qquad\quad \lor e4(self) \lor f(self) \\
\\
Next \triangleq (\exists\, self \in \{0, 1\} : P(self)) \\
\\
Spec \triangleq \land\, Init \land \Box[Next]_{vars} \\
\qquad\quad \land\, \forall\, self \in \{0, 1\} : \mathrm{WF}_{vars}(P(self))
\end{array}$$

END TRANSLATION

$$\begin{array}{l}
InCS(i) \triangleq pc[i] = \text{“cs”} \\
MutualExclusion \triangleq \neg(InCS(0) \land InCS(1)) \\
pcBar \triangleq [i \in \{0, 1\} \mapsto \text{IF } pc[i] \in \{\text{“ncs”}, \text{“f”}\} \text{ THEN “r”} \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \text{ELSE } pc[i]] \\
A \triangleq \text{INSTANCE } OneBitProtocol \text{ WITH } x \leftarrow x, \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad pc \leftarrow pcBar \\
Trying(i) \triangleq pc[i] \in \text{IF } i = 0 \text{ THEN } \{\text{“e1”}, \text{“e2”}\} \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad \text{ELSE } \{\text{“e1”}, \text{“e2”}, \text{“e3”}, \text{“e4”}\} \\
DeadlockFree \triangleq (Trying(0) \lor Trying(1)) \rightsquigarrow (InCS(0) \lor InCS(1))
\end{array}$$

* Modification History
* Last modified Sat *Jun* 07 15:59:59 *CST* 2014 by *yaojingguo*
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