──────────────────────── MODULE *Handshake* ────────────────────────

EXTENDS *Integers*, *Sequences*

$Put(s) \triangleq Append(s, \text{"widget"})$
$Get(s) \triangleq Tail(s)$

$a \oplus b \triangleq (a + b)\%2$

****

--algorithm *Handshake***{**
 variables $p = 0$, $c = 0$, $box = \langle \rangle$;
 fair process (*Producer* $= 0$)
   { *p1*: **while** (TRUE)
         {   **await** $p = c$;
             p2: $box := Put(box)$;
             p3: $p := p \oplus 1$
             }
    }
 fair process (*Consumer* $= 1$)
   { *c1*: **while** (TRUE)
         {   **await** $p \neq c$;
             c2: $box := Get(box)$;
             c3: $c := c \oplus 1$
             }
    }
 }
 ****

 BEGIN TRANSLATION
 VARIABLES p, c, box, pc

$vars \triangleq \langle p, c, box, pc \rangle$

$ProcSet \triangleq \{0\} \cup \{1\}$

$Init \triangleq$ Global variables
         $\wedge p = 0$
         $\wedge c = 0$
         $\wedge box = \langle \rangle$
         $\wedge pc = [self \in ProcSet \mapsto$ CASE $self = 0 \rightarrow$ "p1"
                                     $\Box \quad self = 1 \rightarrow$ "c1"$]$

$p1 \triangleq \wedge pc[0] =$ "p1"
         $\wedge p = c$
         $\wedge pc' = [pc$ EXCEPT $![0] =$ "p2"$]$
         $\wedge$ UNCHANGED $\langle p, c, box \rangle$

$p2 \triangleq \wedge pc[0] =$ "p2"

1

$$\land\ box' = Put(box)$$
$$\land\ pc' = [pc\ \text{EXCEPT}\ ![0] = \text{``p3''}]$$
$$\land\ \text{UNCHANGED}\ \langle p,\ c \rangle$$

$p3\ \triangleq\ \land\ pc[0] = \text{``p3''}$
$\qquad\quad\ \land\ p' = p \oplus 1$
$\qquad\quad\ \land\ pc' = [pc\ \text{EXCEPT}\ ![0] = \text{``p1''}]$
$\qquad\quad\ \land\ \text{UNCHANGED}\ \langle c,\ box \rangle$

$Producer\ \triangleq\ p1 \lor p2 \lor p3$

$c1\ \triangleq\ \land\ pc[1] = \text{``c1''}$
$\qquad\quad\ \land\ p \neq c$
$\qquad\quad\ \land\ pc' = [pc\ \text{EXCEPT}\ ![1] = \text{``c2''}]$
$\qquad\quad\ \land\ \text{UNCHANGED}\ \langle p,\ c,\ box \rangle$

$c2\ \triangleq\ \land\ pc[1] = \text{``c2''}$
$\qquad\quad\ \land\ box' = Get(box)$
$\qquad\quad\ \land\ pc' = [pc\ \text{EXCEPT}\ ![1] = \text{``c3''}]$
$\qquad\quad\ \land\ \text{UNCHANGED}\ \langle p,\ c \rangle$

$c3\ \triangleq\ \land\ pc[1] = \text{``c3''}$
$\qquad\quad\ \land\ c' = c \oplus 1$
$\qquad\quad\ \land\ pc' = [pc\ \text{EXCEPT}\ ![1] = \text{``c1''}]$
$\qquad\quad\ \land\ \text{UNCHANGED}\ \langle p,\ box \rangle$

$Consumer\ \triangleq\ c1 \lor c2 \lor c3$

$Next\ \triangleq\ Producer \lor Consumer$

$Spec\ \triangleq\ \land\ Init \land \Box[Next]_{vars}$
$\qquad\qquad\ \land\ \text{WF}_{vars}(Producer)$
$\qquad\qquad\ \land\ \text{WF}_{vars}(Consumer)$

END TRANSLATION
$A\ \triangleq\ \text{INSTANCE}\ Alternation\ \text{WITH}\ b \leftarrow p \oplus c,\ box \leftarrow box$

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