─────────────── MODULE *OpCounter* ───────────────

EXTENDS
  Naturals, *Sequences*, *SEC*

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VARIABLE
  counter,
  buffer,
  seq,
  incoming,   network variable
  msg,   network variable
  messageset   network variable

vars ≜ ⟨*counter*, *buffer*, *seq*, *incoming*, *msg*, *messageset*, *SECvars*⟩

Msg ≜ [*r* : *Replica*, *update* : SUBSET *Update*, *seq* : *Nat*, *buf* : *Nat*]

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Reliable *Network*

Network ≜ INSTANCE *ReliableNetwork*

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TypeOK ≜
  ∧   *counter* ∈ [*Replica* → *Nat*]
  ∧   *buffer* ∈ [*Replica* → *Nat*]

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Init ≜
  ∧ *Network*!*RInit*
  ∧ *SECInit*
  ∧ *seq* = [*r* ∈ *Replica* ↦ 0]
  ∧ *counter* = [*r* ∈ *Replica* ↦ 0]
  ∧ *buffer* = [*r* ∈ *Replica* ↦ 0]

Read(*r*) ≜ *counter*[*r*]

Inc(*r*) ≜
  ∧ *counter*′ = [*counter* EXCEPT ![*r*] = @ + 1]
  ∧ *buffer*′ = [*buffer* EXCEPT ![*r*] = @ + 1]
  ∧ *seq*′ = [*seq* EXCEPT ![*r*] = @ + 1]
  ∧ *SECUpdate*(*r*, *seq*[*r*])
  ∧ UNCHANGED ⟨*incoming*, *msg*, *messageset*⟩

Send(*r*) ≜
  ∧ *buffer*[*r*] ≠ 0
  ∧ *buffer*′ = [*buffer* EXCEPT ![*r*] = 0]
  ∧ *Network*!*RBroadcast*(*r*, [*r* ↦ *r*, *seq* ↦ *seq*[*r*], *update* ↦ *OpUpdate*(*r*), *buf* ↦ *buffer*[*r*]])
  ∧ *SECSend*(*r*)
  ∧ UNCHANGED ⟨*counter*, *seq*⟩

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$Receive(r) \triangleq$
 $\wedge$ $Network!RDeliver(r)$
 $\wedge$ $SECDeliver(r,\ msg'[r])$
 $\wedge$ $counter' = [counter \text{ EXCEPT } ![r] = @ + msg'[r].buf]$
 $\wedge$ $\text{UNCHANGED } \langle buffer,\ seq \rangle$

$Next \triangleq$
 $\exists\, r \in Replica : Inc(r) \vee Send(r) \vee Receive(r)$

$Spec \triangleq Init \wedge \Box[Next]_{vars}$

$EmptyBuffer \triangleq buffer = [r \in Replica \mapsto 0]$
$EC \triangleq Network!EmptyChannel \wedge EmptyBuffer$
    $\Rightarrow \forall\, r1,\ r2 \in Replica : counter[r1] = counter[r2]$

$SEC \triangleq \forall\, r1,\ r2 \in Replica : Sameupdate(r1,\ r2)$
    $\Rightarrow counter[r1] = counter[r2]$

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