MODULE *AJupiterExtended*

AJupiter extended with *JupiterCtx*. This is used to show that *AJupiter* implements *XJupiter*.

EXTENDS *JupiterCtx*, *BufferStateSpace* *TODO*: To extend *AJupiter*

VARIABLES *cbuf*, *crec*, *sbuf*, *srec*, *cincomingXJ*, *sincomingXJ*

$varsEx \triangleq \langle intVars, ctxVars, cbuf, crec, sbuf, srec, cincomingXJ, sincomingXJ\rangle$

$AJMsgEx \triangleq [ack : Nat, cop : Cop, oid : Oid]$

$commXJ \triangleq$ INSTANCE *CSComm* WITH $Msg \leftarrow Seq(Cop)$,
$cincoming \leftarrow cincomingXJ$, $sincoming \leftarrow sincomingXJ$

$TypeOKEx \triangleq$
- $\land\ TypeOKInt$
- $\land\ TypeOKCtx$
- $\land\ commXJ!TypeOK$
- $\land\ crec \in [Client \to Nat]$
- $\land\ srec \in [Client \to Nat]$
- $\land\ cbuf \in [Client \to Seq(Cop)]$
- $\land\ sbuf \in [Client \to Seq(Cop)]$

$InitEx \triangleq$
- $\land\ InitInt$
- $\land\ InitCtx$
- $\land\ commXJ!Init$
- $\land\ crec = [c \in Client \mapsto 0]$
- $\land\ srec = [c \in Client \mapsto 0]$
- $\land\ cbuf = [c \in Client \mapsto \langle\rangle]$
- $\land\ sbuf = [c \in Client \mapsto \langle\rangle]$

$DoOpEx(c, op) \triangleq$
LET $cop \triangleq [op \mapsto op, oid \mapsto [c \mapsto c, seq \mapsto cseq[c]], ctx \mapsto ds[c]]$
IN
- $\land\ crec' = [crec$ EXCEPT $![c] = 0]$
- $\land\ cbuf' = [cbuf$ EXCEPT $![c] = Append(@, cop)]$
- $\land\ SetNewAop(c, op)$
- $\land\ Comm!CSend([ack \mapsto crec[c], cop \mapsto cop, oid \mapsto cop.oid])$
- $\land\ commXJ!CSend(cop)$

$ClientPerformEx(c, m) \triangleq$
LET $xform \triangleq xFormShift(COT, m.cop, cbuf[c], m.ack)$
IN
- $\land\ cbuf' = [cbuf$ EXCEPT $![c] = xform.xops]$
- $\land\ crec' = [crec$ EXCEPT $![c] = @ + 1]$
- $\land\ SetNewAop(c, xform.xop.op)$

$ServerPerformEx(m) \triangleq$
LET $c \triangleq ClientOf(m.cop)$

$xform \triangleq xFormShift(COT,\ m.cop,\ sbuf[c],\ m.ack)$
$xcop \triangleq xform.xop$
IN $\land\ srec' = [cl \in Client \mapsto \text{IF } cl = c \text{ THEN } srec[cl] + 1 \text{ ELSE } 0]$
$\land\ sbuf' = [cl \in Client \mapsto \text{IF } cl = c \text{ THEN } xform.xops$
$\text{ELSE } Append(sbuf[cl],\ xcop)]$
$\land\ SetNewAop(Server,\ xcop.op)$
$\land\ Comm!SSend(c,\ [cl \in Client \mapsto$
$[ack \mapsto srec[cl],\ cop \mapsto xcop,\ oid \mapsto xcop.oid]])$
$\land\ commXJ!SSendSame(c,\ xcop)$

$DoEx(c) \triangleq$
$\land\ DoInt(DoOpEx,\ c)$
$\land\ DoCtx(c)$
$\land$ UNCHANGED $\langle sbuf,\ srec\rangle$

$RevEx(c) \triangleq$
$\land\ RevInt(ClientPerformEx,\ c)$
$\land\ RevCtx(c)$
$\land\ commXJ!CRev(c)$
$\land$ UNCHANGED $\langle sbuf,\ srec\rangle$

$SRevEx \triangleq$
$\land\ SRevInt(ServerPerformEx)$
$\land\ SRevCtx$
$\land\ commXJ!SRev$
$\land$ UNCHANGED $\langle cbuf,\ crec\rangle$

$NextEx \triangleq$
$\lor\ \exists\, c \in Client : DoEx(c) \lor RevEx(c)$
$\lor\ SRevEx$

$FairnessEx \triangleq$
$\text{WF}_{varsEx}(SRevEx \lor \exists\, c \in Client : RevEx(c))$

$SpecEx \triangleq InitEx \land \Box[NextEx]_{varsEx}$ $\land\ FairnessEx$

$QC \triangleq$ Quiescent Consistency
$Comm!EmptyChannel \Rightarrow Cardinality(Range(state)) = 1$

THEOREM $SpecEx \Rightarrow \Box QC$

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* Modification History
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