MODULE *CJupiter*

Specification of *CJupiter*; see *Wei@OPODIS'2018*.

EXTENDS *JupiterSerial*, *GraphStateSpace*

VARIABLES

css — *css*[*r*]: the n-ary ordered state space at replica $r \in Replica$

$vars \triangleq \langle intVars,\ ctxVars,\ serialVars,\ css \rangle$

$TypeOK \triangleq$
- $\land$ *TypeOKInt*
- $\land$ *TypeOKCtx*
- $\land$ *TypeOKSerial*
- $\land$ $\forall\, r \in Replica : IsSS(css[r])$

$Init \triangleq$
- $\land\ InitInt$
- $\land\ InitCtx$
- $\land\ InitSerial$
- $\land\ css = [r \in Replica \mapsto EmptySS]$

$NextEdge(r,\ u,\ ss) \triangleq$ Return the first outgoing edge from u in ss at replica r

CHOOSE $e \in ss.edge$:
- $\land\ e.from = u$
- $\land\ \forall\, ue \in ss.edge \setminus \{e\}$:
  - $(ue.from = u) \Rightarrow tb(e.cop.oid,\ ue.cop.oid,\ serial[r])$

$Perform(r,\ cop) \triangleq$

LET $xform \triangleq xForm(NextEdge,\ r,\ cop,\ css[r])$ — *xform*: [*xcop*, *xss*, lss]

IN
- $\land\ css' = [css$ EXCEPT $![r] = @ \oplus xform.xss]$
- $\land\ SetNewAop(r,\ xform.xcop.op)$

$ClientPerform(c,\ cop) \triangleq Perform(c,\ cop)$

$ServerPerform(cop) \triangleq$
- $\land\ Perform(Server,\ cop)$
- $\land\ Comm!SSendSame(ClientOf(cop),\ cop)$ broadcast the original cop

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$DoOp(c,\ op) \triangleq$

LET $cop \triangleq [op \mapsto op,\ oid \mapsto [c \mapsto c,\ seq \mapsto cseq[c]],\ ctx \mapsto ds[c]]$

IN
- $\land\ ClientPerform(c,\ cop)$
- $\land\ Comm!CSend(cop)$

$Do(c) \triangleq$
- $\land\ DoInt(DoOp,\ c)$
- $\land\ DoCtx(c)$

$\land\ DoSerial(c)$

$Rev(c) \triangleq$
$\land\ RevInt(ClientPerform,\ c)$
$\land\ RevCtx(c)$
$\land\ RevSerial(c)$

$SRev \triangleq$
$\land\ SRevInt(ServerPerform)$
$\land\ SRevCtx$
$\land\ SRevSerial$

$Next \triangleq$
$\lor \exists\, c \in Client : Do(c) \lor Rev(c)$
$\lor\ SRev$

$Fairness \triangleq$
$\mathrm{WF}_{vars}(SRev \lor \exists\, c \in Client : Rev(c))$

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

$Compactness \triangleq$ Compactness of *CJupiter*: the *CSSes* at all replicas are the same.
$Comm\,!\,EmptyChannel \Rightarrow Cardinality(Range(css)) = 1$

THEOREM $Spec \Rightarrow \Box Compactness$

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* Modification History
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