MODULE *SerializabilityDRefinement*

Show that *SerializabilityD* refines *Serializability*

EXTENDS *SerializabilityD*

VARIABLES $fateP$, toP, $benvP$, $tenvP$

$$
\begin{array}{l}
InitDR \triangleq \text{LET } CTs \triangleq \{t \in Tr \setminus \{T0\} : fateP[t] = Committed\} \\
\qquad\qquad OrdP(t) \triangleq \text{CHOOSE } i \in \text{DOMAIN } toP : toP[i] = t \\
\quad \text{IN} \\
\quad \land\, InitD \\
\quad \land\, fateP \in [Tr \setminus \{T0\} \to \{Committed,\ Aborted\}] \\
\quad \land\, toP \in Orderings(CTs) \\
\quad \land\, benvP \in [1 \,..\, Cardinality(CTs) + 1 \to [Obj \to Val]] \\
\quad \land\, tenvP \in \{f \in [CTs \to [Obj \to Val]] : \forall\, t \in CTs : f[t] = benvP[OrdP(t)]\}
\end{array}
$$

$$
\begin{array}{l}
PredictR \triangleq \land\, Predict \\
\qquad\qquad \land\, fate' = fateP \\
\qquad\qquad \land\, to' = toP \\
\qquad\qquad \land\, benv' = benvP \\
\qquad\qquad \land\, tenv' = tenvP \\
\qquad\qquad \land\, \text{UNCHANGED } \langle fateP,\ toP,\ benvP,\ tenvP\rangle
\end{array}
$$

$$
\begin{array}{l}
NextDR \triangleq \lor\, PredictR \\
\qquad\qquad \lor\, \land\, Initialized \\
\qquad\qquad\quad\ \land\, Next \\
\qquad\qquad\quad\ \land\, \text{UNCHANGED } \langle fateP,\ toP,\ benvP,\ tenvP\rangle
\end{array}
$$

$$vv \triangleq \langle tr,\ op,\ arg,\ rval,\ tstate,\ fate,\ to,\ tenv,\ benv,\ ff,\ fateP,\ toP,\ benvP,\ tenvP\rangle$$

$$SpecDR \triangleq InitDR \land \Box[NextDR]_{vv}$$

$$
\begin{array}{l}
Ser \triangleq \text{INSTANCE } Serializability \text{ WITH} \\
\quad fate \leftarrow \text{IF } fate = NULL \text{ THEN } fateP \text{ ELSE } fate, \\
\quad to \leftarrow \text{IF } to = NULL \text{ THEN } toP \text{ ELSE } to, \\
\quad tenv \leftarrow \text{IF } tenv = NULL \text{ THEN } tenvP \text{ ELSE } tenv, \\
\quad benv \leftarrow \text{IF } benv = NULL \text{ THEN } benvP \text{ ELSE } benv
\end{array}
$$

$$SerSpec \triangleq Ser!Init \land \Box[Ser!Next]_{Ser!v}$$

THEOREM $SpecDR \Rightarrow SerSpec$