MODULE *BossWorker*

EXTENDS *Naturals*, *FiniteSets*

Specification of the *BossWorker* smart contract

CONSTANT *workers*, *possibleClaims*
VARIABLES *rollupsPhase*, *workerStatus*, *correctClaim*, *claims*

Useful global definitions

$$RollupsPhase \triangleq$$
$$\{\text{"InputAccumulation"}, \quad \text{receiving inputs}$$
$$\text{"ClaimSuggestion"}, \quad \text{accepting suggestions from workers}$$
$$\text{"ClaimOverwrite"}, \quad \text{boss can overwrite suggestions}$$
$$\text{"ClaimSubmission"}\} \quad \text{workers can submit claim}$$

$$WorkerStatus \triangleq$$
$$\{\text{"Unemployed"}, \quad \text{worker does nothing}$$
$$\text{"Applying"}, \quad \text{worker wants to be hired}$$
$$\text{"Employed"}, \quad \text{worker can suggest and submit claims}$$
$$\text{"Fired"}\} \quad \text{worker does nothing and can't reapply for the job}$$

$$TypeOK \triangleq$$
$$\land \quad workerStatus \in [workers \to WorkerStatus]$$
$$\land \quad rollupsPhase \in RollupsPhase$$
$$\land \quad correctClaim \in possibleClaims$$
$$\land \quad claims \subseteq possibleClaims$$

$$ClaimOK \triangleq$$
$$\text{it's ok to not claim}$$
$$\lor \; claims = \{\}$$
$$\text{but, if there is a claim, it should be correct}$$
$$\lor \; \land \; Cardinality(claims) = 1$$
$$\quad \land (\text{CHOOSE } claim \in claims : \text{TRUE}) = correctClaim$$
$$\text{there should be no more than one claim}$$

$$SubmittedClaimOK \triangleq$$
$$rollupsPhase = \text{"ClaimSubmission"} \Rightarrow ClaimOK$$

Initial state definition

$$
\begin{array}{l}
Init \triangleq \\
\quad \land\ workerStatus = [worker \in workers \mapsto \text{“Unemployed”}] \\
\quad \land\ rollupsPhase \in RollupsPhase \\
\quad \land\ correctClaim \in possibleClaims \\
\quad \land\ claims = \{\}
\end{array}
$$

Worker status changes

$$
\begin{array}{l}
WorkerAppliesForJob \triangleq \\
\quad \exists\, worker \in workers : \\
\qquad \land\ workerStatus[worker] = \text{“Unemployed”} \\
\qquad \land\ workerStatus' = [workerStatus \text{ EXCEPT } ![worker] = \text{“Applying”}] \\
\qquad \land\ \text{UNCHANGED } \langle rollupsPhase,\ correctClaim,\ claims \rangle
\end{array}
$$

$$
\begin{array}{l}
WorkerGetsEmployed \triangleq \\
\quad \exists\, worker \in workers : \\
\qquad \land\ workerStatus[worker] = \text{“Applying”} \\
\qquad \land\ workerStatus' = [workerStatus \text{ EXCEPT } ![worker] = \text{“Employed”}] \\
\qquad \land\ \text{UNCHANGED } \langle rollupsPhase,\ correctClaim,\ claims \rangle
\end{array}
$$

$$
\begin{array}{l}
WorkerGetsFired \triangleq \\
\quad \exists\, worker \in workers : \\
\qquad \land\ workerStatus[worker] = \text{“Employed”} \\
\qquad \land\ workerStatus' = [workerStatus \text{ EXCEPT } ![worker] = \text{“Fired”}] \\
\qquad \land\ \text{UNCHANGED } \langle rollupsPhase,\ correctClaim,\ claims \rangle
\end{array}
$$

Rollups phase-related changes

$$
\begin{array}{l}
UserSendsInput \triangleq \\
\quad \exists\, claim \in possibleClaims : \\
\qquad \land\ rollupsPhase = \text{“InputAccumulation”} \\
\qquad \land\ correctClaim' = claim \quad \text{(the input changes the machine hash)} \\
\qquad \land\ \text{UNCHANGED } \langle rollupsPhase,\ workerStatus,\ claims \rangle
\end{array}
$$

$$
\begin{array}{l}
WorkerSuggestsClaim \triangleq \\
\quad \exists\, worker \in workers : \\
\qquad \exists\, claim \in possibleClaims : \\
\qquad\quad \land\ workerStatus[worker] = \text{“Employed”} \\
\qquad\quad \land\ rollupsPhase = \text{“ClaimSuggestion”} \\
\qquad\quad \land\ claims' = claims \cup \{claim\} \quad \text{(the order of claims is ignored)} \\
\qquad\quad \land\ \text{UNCHANGED } \langle rollupsPhase,\ workerStatus,\ correctClaim \rangle
\end{array}
$$

$$
\begin{array}{l}
BossOverwritesClaim \triangleq \\
\quad \land\ rollupsPhase = \text{“ClaimOverwrite”} \\
\quad \land\ claims' = \{correctClaim\} \quad \text{(we assume the boss knows the correct claim)}
\end{array}
$$

$\land$ UNCHANGED $\langle rollupsPhase,\ workerStatus,\ correctClaim \rangle$

$RollupsPhaseAdvances \triangleq$
$\lor \land rollupsPhase = \text{“InputAccumulation”}$
$\land rollupsPhase' = \text{“ClaimSuggestion”}$
$\land$ UNCHANGED $\langle workerStatus,\ correctClaim,\ claims \rangle$
$\lor \land rollupsPhase = \text{“ClaimSuggestion”}$
$\land rollupsPhase' = \text{“ClaimOverwrite”}$
$\land$ UNCHANGED $\langle workerStatus,\ correctClaim,\ claims \rangle$
$\lor \land rollupsPhase = \text{“ClaimOverwrite”}$
$\land ClaimOK$ (we assume the boss has enough time to overwrite bad claims)
$\land rollupsPhase' = \text{“ClaimSubmission”}$
$\land$ UNCHANGED $\langle workerStatus,\ correctClaim,\ claims \rangle$
$\lor \land rollupsPhase = \text{“ClaimSubmission”}$
$\land rollupsPhase' = \text{“InputAccumulation”}$
$\land claims' = \{\}$ (the old claims are erased)
$\land$ UNCHANGED $\langle workerStatus,\ correctClaim \rangle$

Next state definition

$Next \triangleq$
$\lor WorkerAppliesForJob$
$\lor WorkerGetsEmployed$
$\lor WorkerGetsFired$
$\lor UserSendsInput$
$\lor WorkerSuggestsClaim$
$\lor BossOverwritesClaim$
$\lor RollupsPhaseAdvances$

* Modification History
* Last modified *Tue* May 31 13:58:20 *BRT* 2022 by *guilherme*
* Created *Mon* May 30 11:40:33 *BRT* 2022 by *guilherme*