

$$NoRecvSet(m) \triangleq \text{IF } Shared.chipCount \in \{2, 4\} \text{ THEN } \{m.id, 3\} \text{ ELSE } \{m.id\}$$

$$A_NoRecvSet(m) \triangleq \{m.id\}$$

$$RecvHard(m) \triangleq$$

$$\wedge \text{CASE } m.res \neq \{-1\} \wedge m.procFlag = 1$$

$$\begin{aligned} \rightarrow \wedge Shared' &= [Shared \text{ EXCEPT } !.medium = \{\}, \\ &!.proc = @ \cup \{m.id\}] \end{aligned}$$

$$\wedge \text{UNCHANGED } ProcState$$

$$\square m.res \neq \{-1\} \wedge m.procFlag = 0$$

$$\begin{aligned} \rightarrow \wedge Shared' &= [Shared \text{ EXCEPT } !.medium = \{\}, \\ &!.proc = @ \setminus \{m.id\}] \end{aligned}$$

$$\wedge ProcState' =$$

$$[i \in (Proc \setminus Shared.proc) \cup NoRecvSet(m) \mapsto ProcState[i]] @@$$

$$[i \in Shared.proc \setminus NoRecvSet(m) \mapsto [ProcState[i] \text{ EXCEPT}$$

$$!.token = \text{IF } m.id = ProcState[i].token$$

$$\text{THEN } next(m.id, Shared.proc)$$

$$\text{ELSE } @]]$$

$$\square m.res = \{-1\}$$

$$\rightarrow \wedge Shared' = [Shared \text{ EXCEPT } !.medium = \{\}]$$

$$\wedge \text{UNCHANGED } ProcState$$

$$\wedge TaskState' =$$

$$[i \in NoRecvSet(m) \mapsto TaskState[i]] @@$$

$$[i \in Task \setminus NoRecvSet(m) \mapsto [TaskState[i] \text{ EXCEPT}$$

$$!.msg = Append(@, m),$$

$$!.execTimer = \text{IF } Len(TaskState[i].msg) = 0 \text{ THEN } pi \text{ ELSE } @,$$

$$!.cons = \text{IF } m.res \neq \{-1\} \text{ THEN } @ + 1 \text{ ELSE } @,$$

$$!.res = \text{IF } m.res = \{-1\}$$

$$\begin{aligned}
& \text{THEN } [j \in Task \mapsto \text{IF } j = m.id \text{ THEN } -1 \text{ ELSE } @[j]] \\
& \text{ELSE } [j \in Task \mapsto \text{IF } j \in m.res \text{ THEN } m.id \text{ ELSE } @[j]]] \\
& \wedge \text{UNCHANGED } History \\
\\
RecvSoft(m) & \triangleq \\
& \wedge \text{LET } lastSoft \triangleq \wedge 2 * delta \leq Shared.chipTimer \\
& \wedge Shared.chipTimer \leq deltaChip \\
& \wedge \forall j \in Proc : ProcState[j].token = -1 \\
& \text{IN } Shared' = [Shared \text{ EXCEPT } !.medium = \{\}, \\
& \quad !.macTimer = \text{IF } lastSoft \text{ THEN } Infinity \text{ ELSE } @, \\
& \quad !.proc = \text{IF } lastSoft \text{ THEN } \{\} \text{ ELSE } @] \\
& \wedge ProcState' = [j \in (Proc \setminus Shared.proc) \cup \{m.id\} \mapsto ProcState[j]] @@ \\
& \quad [j \in Shared.proc \setminus \{m.id\} \mapsto [ProcState[j] \text{ EXCEPT} \\
& \quad \quad !.token = next(@, Shared.proc), \\
& \quad \quad !.count = @ + 1]] \\
& \wedge \text{UNCHANGED } \langle TaskState, History \rangle \\
\\
Receive(m) & \triangleq \\
& \wedge Shared.macTimer = 0 \\
& \wedge \text{CASE } m.type = \text{"hard"} \rightarrow RecvHard(m) \\
& \quad \square m.type = \text{"soft"} \rightarrow RecvSoft(m)
\end{aligned}$$